Technical Report EL-93-9
June 1993

US Army Corps
of Engineers
Waterways Experiment
Station

Environmental Characterization for Target Acquisition

Report 3
New Concepts for Evaluating Low-Grazing Angle Radar Measurements

by John O. Curtis, Bruce M. Sabol
Environmental Laboratory

Prepared for U.S. Army Aviation Applied Technology Directorate
and Headquarters, U.S. Army Corps of Engineers

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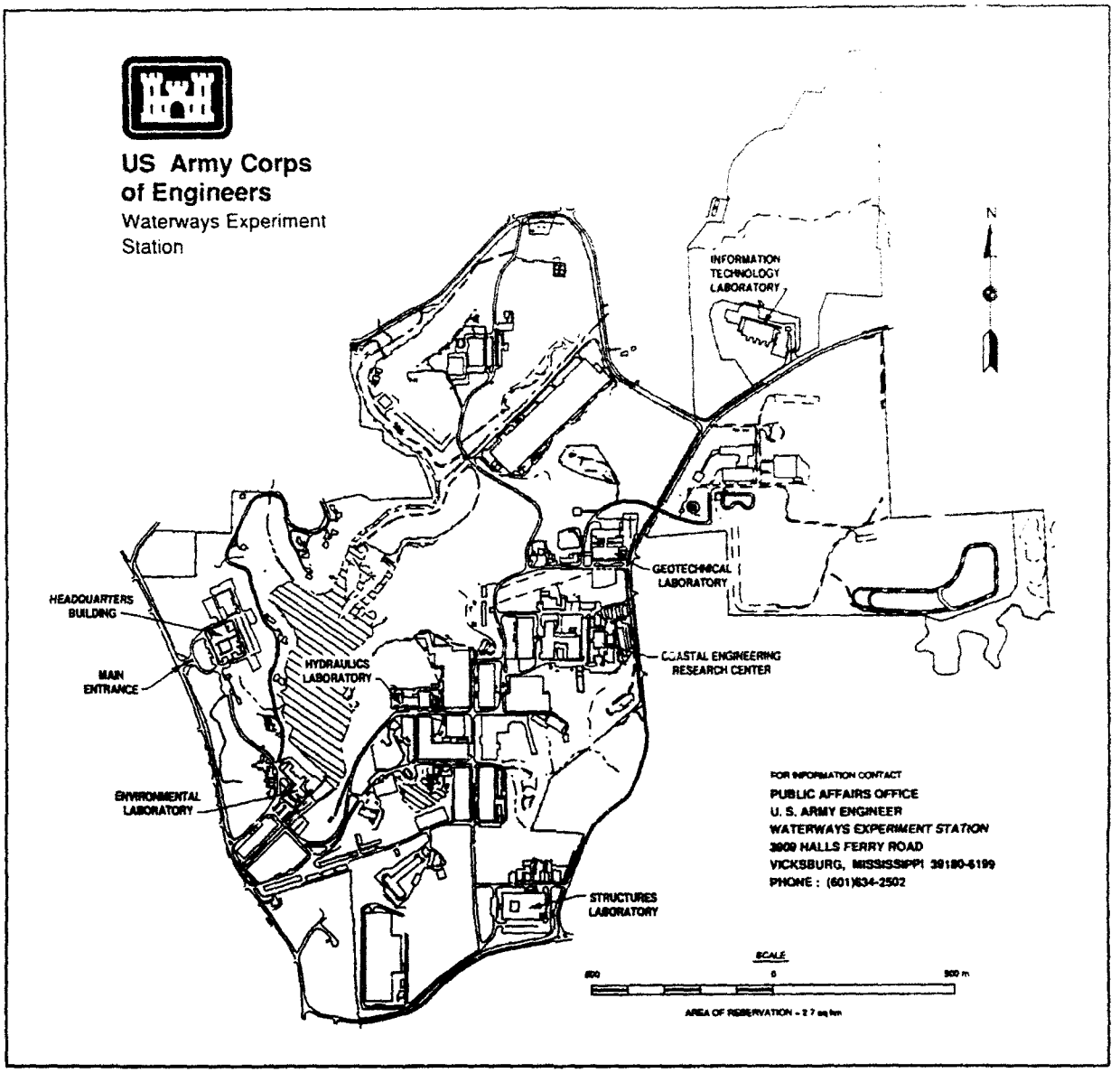

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Preface

The study reported herein was conducted by the U.S. Army Engineer Waterways Experiment Station (WES) during fiscal years 1991-1992 as part of the Environmental Characterization for Target Acquisition Program. This program was jointly funded by the U.S. Army Aviation Applied Technology Directorate (AATD), Fort Eustis, VA, and by Headquarters, U.S. Army Corps of Engineers, Washington, DC. Mr. Nyle Wilcocks was the AATD Technical Monitor.

These efforts were under the general supervision of Dr. John Harrison, Director, Environmental Laboratory (EL), Dr. Victor Barber, Acting Chief, Environmental Systems Division (ESD), EL, and Mr. H. Wade West, Chief, Environmental Analysis Group (EAG), ESD. Mr. Bruce Sabol, EAG, was the Principal Investigator for this project. Dr. John O. Curtis and Mr. Sabol, EAG, prepared this report. The labor-intensive task of assembling Appendix C was capably performed by Mr. Sean Brewer (EAG contract student).

At the time of publication of this report, Director of WES was Dr. Robert W. Whalin. Commander was COL Leonard G. Hassell, EN.

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Conversion Factors, Non-SI to SI Units of Measurement

Non-SI units of measurement used in this report can be converted to SI units of follows:

Multiply	By	To Obtain
degrees (angle)	0.01745329	radians
feet	0.3048	meters

1 Introduction

Background

One possible scenario for modern military helicopter operations involves the use of both natural and man-made ground features to provide cover for the aircraft until the pilot decides to pop up and attempts to locate and fire on a suspected target. Target acquisition and weapon delivery procedures will ultimately be automated, making use of a number of different sensors whose data may be fused to provide the greatest opportunity for success. The design of such sensors and sensor fusion algorithms can be optimized by a thorough understanding of terrain and target interactions with each other and with each sensor under various environmental conditions.

To this end, the U.S. Army Aviation Applied Technology Directorate (AATD), located at Fort Eustis, VA, managed a field demonstration of multiple sensors called the Multi-Sensor Fusion Demonstration (MSFD) whose purpose was to collect target acquisition performance data on targets on the ground using data from individual sensors as well as combinations of sensors. The MSFD took place in February and March 1988 at Fort Hunter Liggett, CA. Sensors were provided and tested by two organizations, Martin Marietta Orlando Aerospace and a combined team from Hughes Aircraft Company and Texas Instruments. The U.S. Army Engineer Waterways Experiment Station (WES) was initially tasked by AATD to provide ground truth information for these tests and to conduct studies on the impact of environmental conditions on sensor performance, particularly within the visual and thermal infrared portions of the spectrum.

Objectives of This Study

After completion of the MSFD, WES was additionally tasked with providing input to AATD on how test sites might be characterized with respect to sensors that operate in the millimeter wave portion of the spectrum. The WES staff felt that the first step that should be taken to respond to this last tasking was to closely reexamine existing data collected by millimeter wave sensors with the goal of assessing the impact of terrain conditions on the sensors' ability to locate and identify targets of interest and not simply measuring their ability to find those targets. In other words, the objectives of this study are to determine whether or not the terrain presents target-like features to the sensor and to determine if that behavior can be quantified and modeled so that one might be able to predict future test and/or battlefield performance for a given millimeter wave sensor.

WES has developed an image metrics approach to characterizing test sites within the visible and thermal infrared portions of the spectrum.[1] Because radar data like that collected during the MSFD can be displayed in an "image" form (slant range versus azimuth position), the most logical approach to quantifying target-like features within these images was to apply the appropriate target feature metrics (filters) to the radar data collected at Fort Hunter Liggett. Therefore, one path taken in this study was to acquire as much MSFD radar data as possible, to convert those data to "images," and to apply the simplest radar target feature metrics to those images to quantify target-like features within the environment.

The second path taken to characterize test site terrain with respect to radar sensors was to use a very simple reflectance model to predict the backscatter response of radar energy that is due only to terrain surface geometry at the test site. A point light source was placed at the two locations for the MSFD sensor test-beds and a simple Lambertian scattering model was used to calculate backscattered power from a three-dimensional finite element representation of the test site terrain surface. These predictions were compared qualitatively with real data to determine the relative impact of terrain geometry on radar returns. Furthermore, where available, overlays of the locations of trees and significant shrubbery were prepared to supplement the qualitative assessment of the impact of environmental conditions on radar data.

Scope of Report

Chapter 2 contains a description of the radar data from the MSFD that were acquired by WES for this study as well as some details about how those data had to be processed to produce "images." A description of the target feature metrics used in this study are found in Chapter 3 along with the results of applying those filters to one of the MSFD tests. Chapter 4 discusses the light model and vegetation overlay studies, and Chapter 5 summarizes the results and makes recommendations for future studies and data collection methodology.

Three appendices are included. Appendix A contains a summary of statistics associated with applying the target feature metrics to all of the available radar scenes. Appendix B summarizes target feature metric statistics as they relate to the man-made targets within each scene. Appendix C is a graphical output summary that contains scene filter results, terrain contour maps, backscatter prediction results, and vegetation overlays for all of the scenes.

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[1] B. M. Sabol and S. Rivera. (1993). "Environmental characterization for target acquisition; Report 2, Analysis of EO imagery (in preparation)," U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.

2 MSFD Radar "Images"

Data Supplied to WES

Through the efforts of the AATD, radar data for 31 separate MSFD tests were supplied to WES by Martin Marietta. Of these 31 files, which represented all of the MSFD data possessed by Martin Marietta, only 24 could be read on WES data processing systems without errors. Data were not available from the Hughes/Texas Instrument team. Details on the format of the Martin data and the procedures required to generate radar "images" from these data are presented in a later section.

When reduced to image format, the Martin radar can be thought of as illuminating a patch of terrain roughly 420 m in range depth and encompassing an azimuth sweep of about 24 deg.[1] Table 1 contains a listing of all of the useful Martin data by MSFD test numbers. Also contained in that table is an average range and an azimuth angle (clockwise from north) that can be used to approximately locate the center of the illuminated area. The "High" and "Low" site designations on this table signify the location of the radar system for each test. Depression angles from the radar locations to the center of the test sites never exceeded 6 deg.

Figures 1 and 2 contain ground plane representations of the approximate area covered by each of the MSFD tests for the radar located at the high site and low site, respectively. The elevation contour lines superimposed on these figures are at 200-ft intervals.

Creation of Radar "Images"

The 31 MSFD test files sent to WES by Martin Marietta consisted of range-corrected (but not calibrated) inphase and quadrature frequency domain data for the K_a-band circularly polarized radar system used at the MSFD. Data files ranged in size from 23 MBytes to 73 MBytes and contained multiple azimuth sweeps of each test area and usually two sets of different range gate data. The term "range gate" as used in this report refers to a set of data that is collected by the receiver and recorder within a very specific range of time delays following the transmission of the wave form. Each range gate contained 20 coarse range cells that were defined by the pulse width of the radar wave form. Furthermore, the data were collected by stepping frequencies in both an up and down direction, the total bandwidth of the sweep determining a theoretical limit on range resolution. Data were also collected with the center of the beam at two different elevation settings.

[1] A table of factors for converting non-SI units of measurement to SI (metric) units is presented on page vi.

Table 1
MSFD Test Data Used for These Studies

Test No	Radar Site	Avg Range m	Central Az Angle, deg	Central El Angle, deg
MS5502	HIGH	4120	161 6	2 83
MS5503	HIGH	1780	232 5	5 68
MS5504	HIGH	2460	192 2	4 78
MS5601	HIGH	3015	238 1	3 63
MS5602	HIGH	3960	171 8	2 97
MS5603	HIGH	3650	242 9	3 17
MS5604	HIGH	3040	174.7	3 72
MS5702	HIGH	4460	161 9	2 70
MS5703	HIGH	3935	251.7	2 77
MS5704	HIGH	2340	202.4	4 75
MS5801	HIGH	2430	232.7	3.58
MS5802	HIGH	4460	162 1	2.72
MS5803	HIGH	1450	262.3	5 50
MS5804	HIGH	4450	162.1	2.20
MS6001	LOW	3880	284.7	0.23
MS6002	LOW	3995	286.4	0.33
MS6004	LOW	3840	285.8	0.32
MS6101	LOW	3960	285.6	0.27
MS6102	LOW	3920	286.5	0.27
MS6301S[1]	LOW	1960	277.1	0.75
MS6301L[1]	LOW	3050	277.1	0.42
MS6403	LOW	1555	297.1	0.70
MS6603	LOW	2540	287.9	0.37
MS6701	LOW	2440	275.8	0.67

[1] S = short range; L = long range.

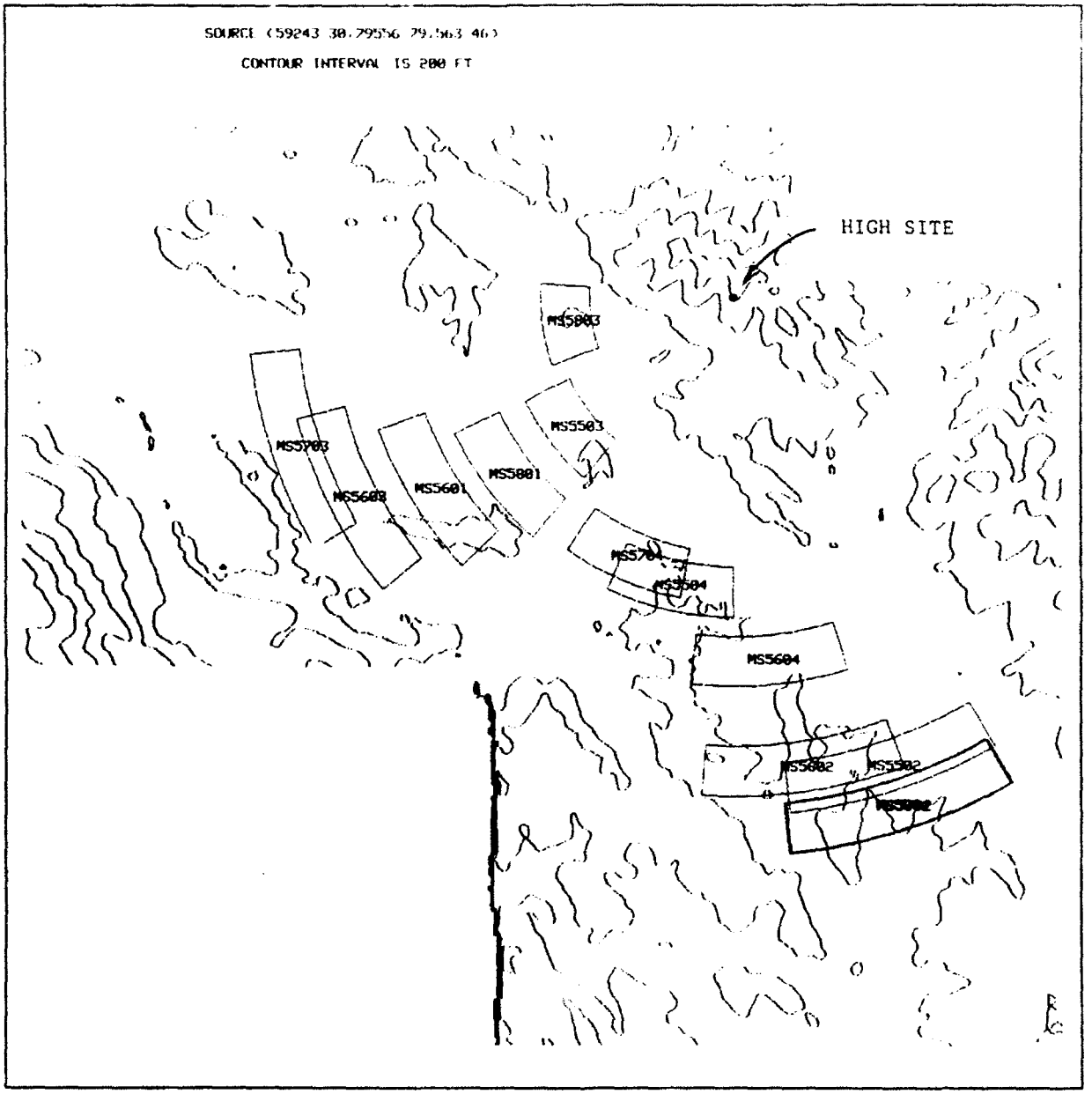


Figure 1. MSFD radar test high site data coverage

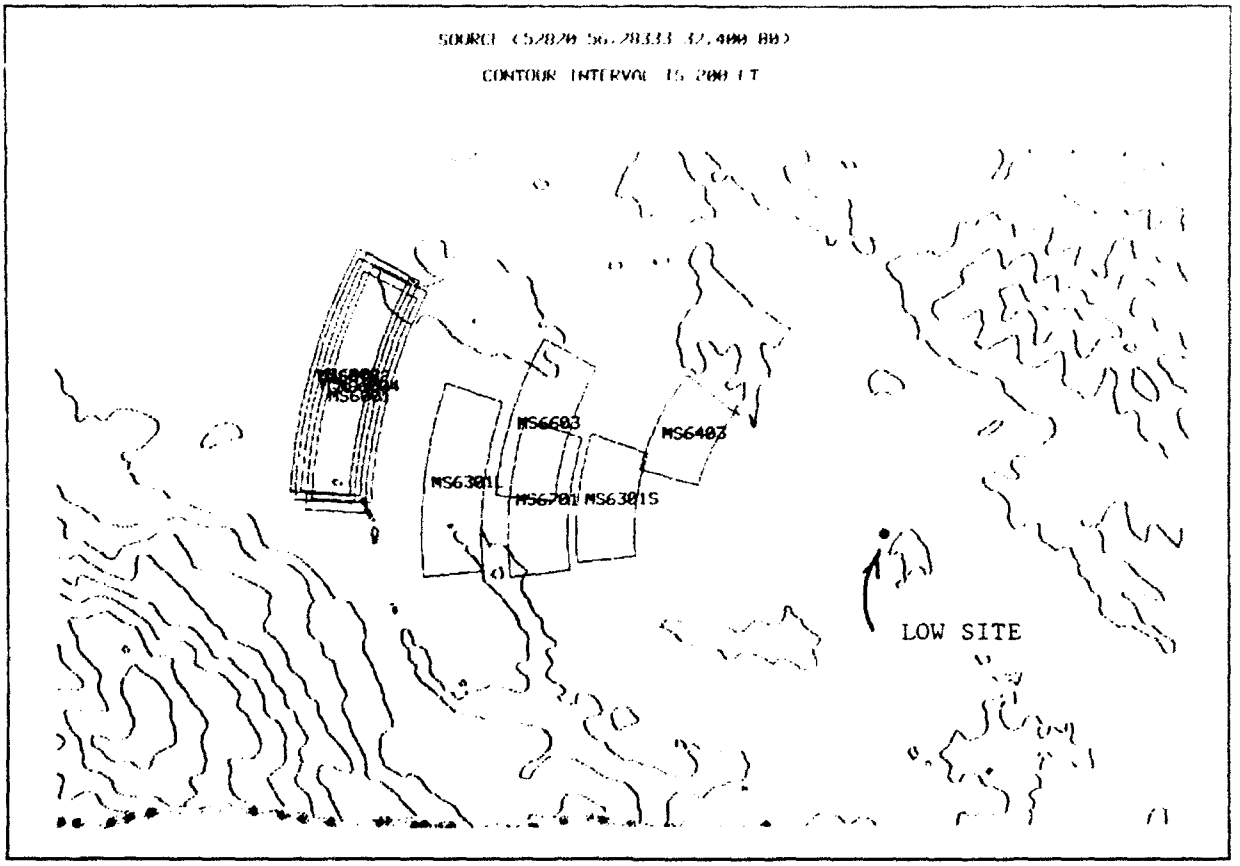


Figure 2. MSFD radar low site data coverage

The point of listing all of these variables that were a part of the data collection process is to emphasize that each data file contained an enormous amount of useful information. For the purposes of this study, much of those data were redundant. This is not to say that sophisticated data processing algorithms could not make good use of multiple terrain sweeps, overlapping elevations, and overlapping range gates, but the study reported herein was not intended to be a target detection optimization effort. Before any of the target feature metrics that form the heart of this site characterization procedure could be applied to a given test, some kind of data compression had to be performed. Acquiring a clear understanding of how the data were arranged and developing a procedure for producing a smaller useful data set was a nontrivial matter.

Martin Marietta provided WES with FORTRAN codes that could be used immediately to read record headers for these data files but that lacked the proprietary subroutine that performed the inverse Fourier Transforms for converting to the time (or range) domain. In addition, it was not discovered until much later that the way in which the data are stored in the frequency domain resulted in a wrap-around of data in range; i.e., one had to know the algorithm for locating the center of each coarse range cell. This algorithm was finally obtained from a classified Martin Marietta report.

Without going into any great detail, the basic procedure for compressing the Martin files into something more useful for these studies was to create a fine-range resolution, two-dimensional map for each radar elevation setting and for each test. The fine-range map was established by first identifying a pair of azimuth sweeps, one in each of two successive range gates, with azimuth marks on the record

headers that were most compatible. This was done by reading all of the headers and computing the minimum sum of squares of differences between successive range gate sweep azimuth marks; in other words, find the pair of azimuth sweeps in successive range gates that best line up. An inverse Fast Fourier Transform routine was written to produce fine-range resolution data from each coarse range cell, overlapping data were eliminated, and a continuous string of fine-range results was produced for each azimuth setting. The end result for each radar elevation or depression angle setting (the elevation designated "bar0" is a depression angle greater than the elevation designated as "bar1") was a multi-dimensional array of data measurements that are proportional to power returned to the radar from the terrain and/or targets. There were 1,400 fine-range cells within each of 33 different azimuth settings, with a separate "image" for each of the two radar polarization combinations (right circular received and left circular received for right circular transmitted signals). In this way, data files that consisted of tens of MBytes of data were compressed to two files (two elevations) of about 370 kBytes each that could readily be turned into two-dimensional "images" in range-azimuth space.

The intent of these studies is not to find a way to improve signal-to-noise ratios to better detect targets within natural backgrounds, but to answer the following question: Given a single sweep of the terrain, how many target-like features are out there? Therefore, an attempt was not made to optimize the data set beyond selecting the best azimuth alignment of successive range gates. Although not tested during this exercise, a simple averaging of the multiple sweeps (subject to some kind of azimuth alignment reasoning) is highly likely to greatly improve the quality of data for stationary targets. Some kind of comparison of data from the two radar elevation settings probably could also be used to minimize terrain background response and to enhance man-made target response.

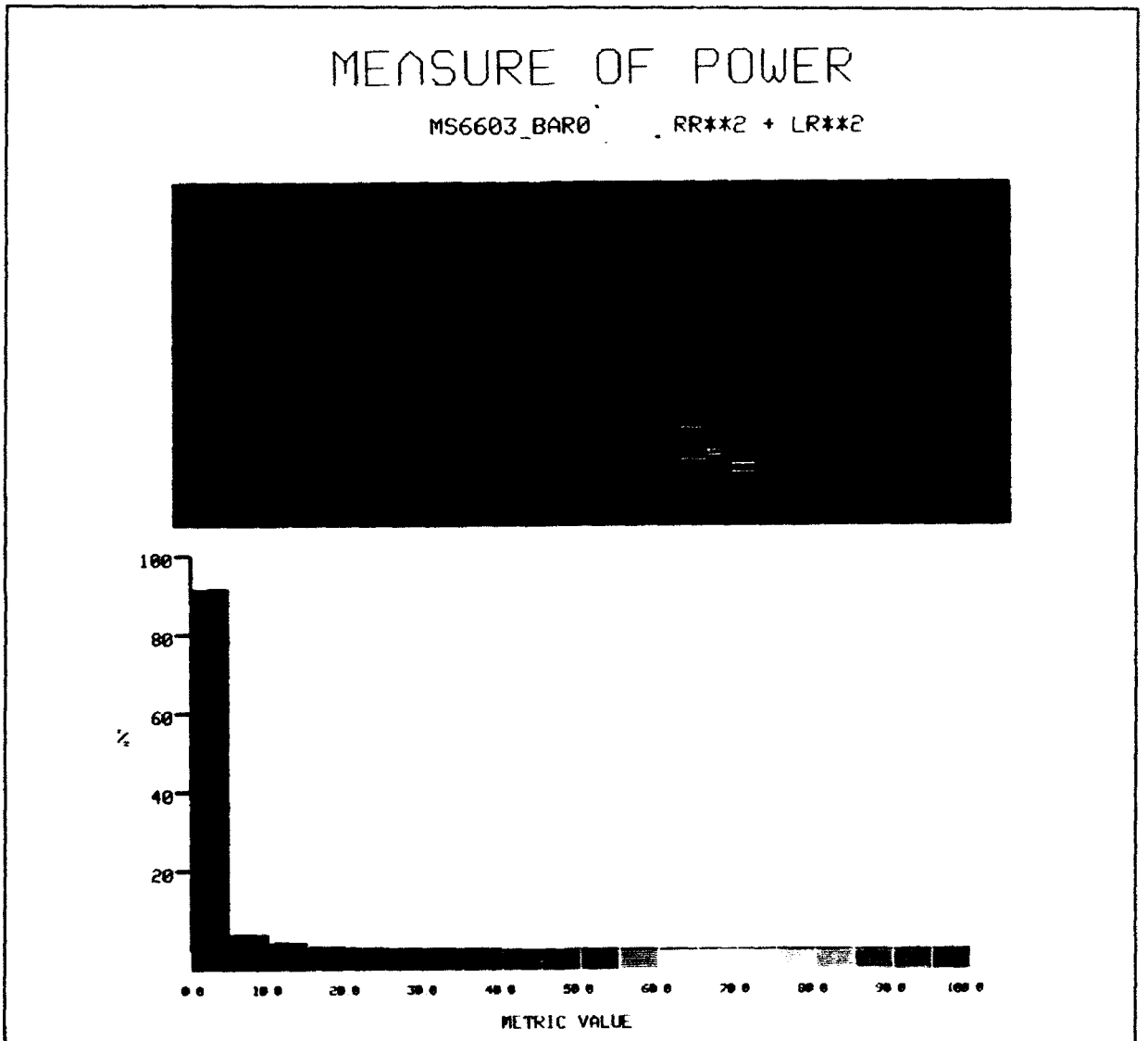
Numbers alone do not have the impact of graphics in transmitting information to the user. Therefore, several FORTRAN routines were written not only to apply metrics to these compressed data sets but also to display data and results of analyses in both two- and three-dimensional formats. All calculations for these studies were performed on a MicroVAX II 630QE computer system, while color graphics were generated on a Raster Technologies Model One/360 graphics display system.

Naturally, in range-azimuth space, each fine-range cell will be represented by a circular arc, and the entire test data set will be represented by circular segments like those shown on Figure 1. However, because of the somewhat limited capabilities of the graphics display system used for these studies and the very fine arcs required to represent each fine-range resolution cell, a conscious decision was made to display range-azimuth data in a rectangular format to prevent any loss of visual information. The drawback to this, as will be seen in a following chapter, is that one distorts the planar geometry and makes comparisons with the results of light model calculations more difficult than if both could be displayed in range-azimuth space. Although the shape of the data display in the rectangular format is not going to be correct, an effort was made to make the width/depth ratio for the displayed data the same as the azimuth/range depth ratio in the real data.

Another concern about how to best visualize the data and calculation results for each test is how to make certain that one test can be immediately compared with another. In other words, nothing done during the compression of data or the application of metrics to those data should change the relative magnitudes of the results. One should be able to look at a color display of power returns for test MS5502 and one for test MS6701 and be confident that what appears as a given color on one test is comparable with the same color on another test. To this end, some effort was made to determine the bounds of data and metric applications to all of the data before selecting a color bar. The absolute magnitudes of test data are meaningless because the data are uncalibrated.

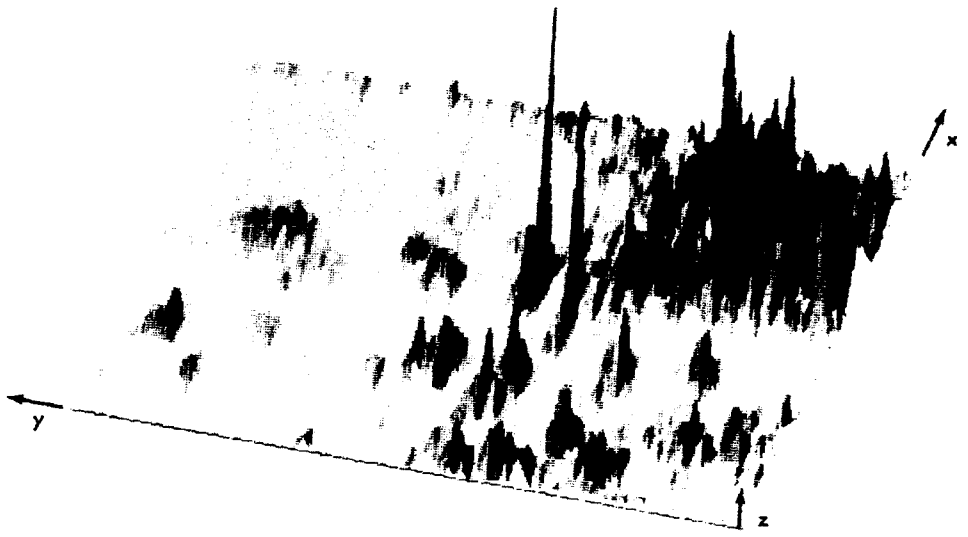
An example of the data is shown on Figure 3, which contains three different representations of the measure of power returned to the radar from the terrain and targets at the site for test MS6603. On a linear scale, only a few features appear as bright colors representing strong returns. As will be seen later, however, these are not all man-made targets. This type of display is a kind of data thresholding, and is very much a function of the strongest signal within the scene. It would be a simple matter to defeat a sensor system based simply on the magnitude of power returned to a radar through the use of radar corner reflectors that are optimized for the wavelength in question. The accompanying three-dimensional representation of the linear data shows just how complex the terrain returns can be for this test site. It is not at all apparent that there are four man-made targets within this patch of natural terrain, three of which are totally in the open and one is camouflaged with brush. More will be said about this observation later. Terrain elevation data contained in Appendix C reveal that the low returns at the longest slant ranges are due to shadowing.

The preferred representation of data in the range-azimuth plane is logarithmic such as that shown in part (c) of Figure 3. Here it is apparent that there are several areas of strong returns and others that are either in shadow or that absorb most of the millimeter wave energy. The black ovals represent the approximate locations of target vehicles within this scene. Although many target detection algorithms probably operate in the linear domain, there appears to be much more informational content in a logarithmic display, particularly when one is trying to relate terrain features to measured data and the results of calculations. Note in the two-dimensional displays that a histogram of data values has been included. These will be significant in determining the quantitative relationships among various tests and will be further discussed in the next chapter.



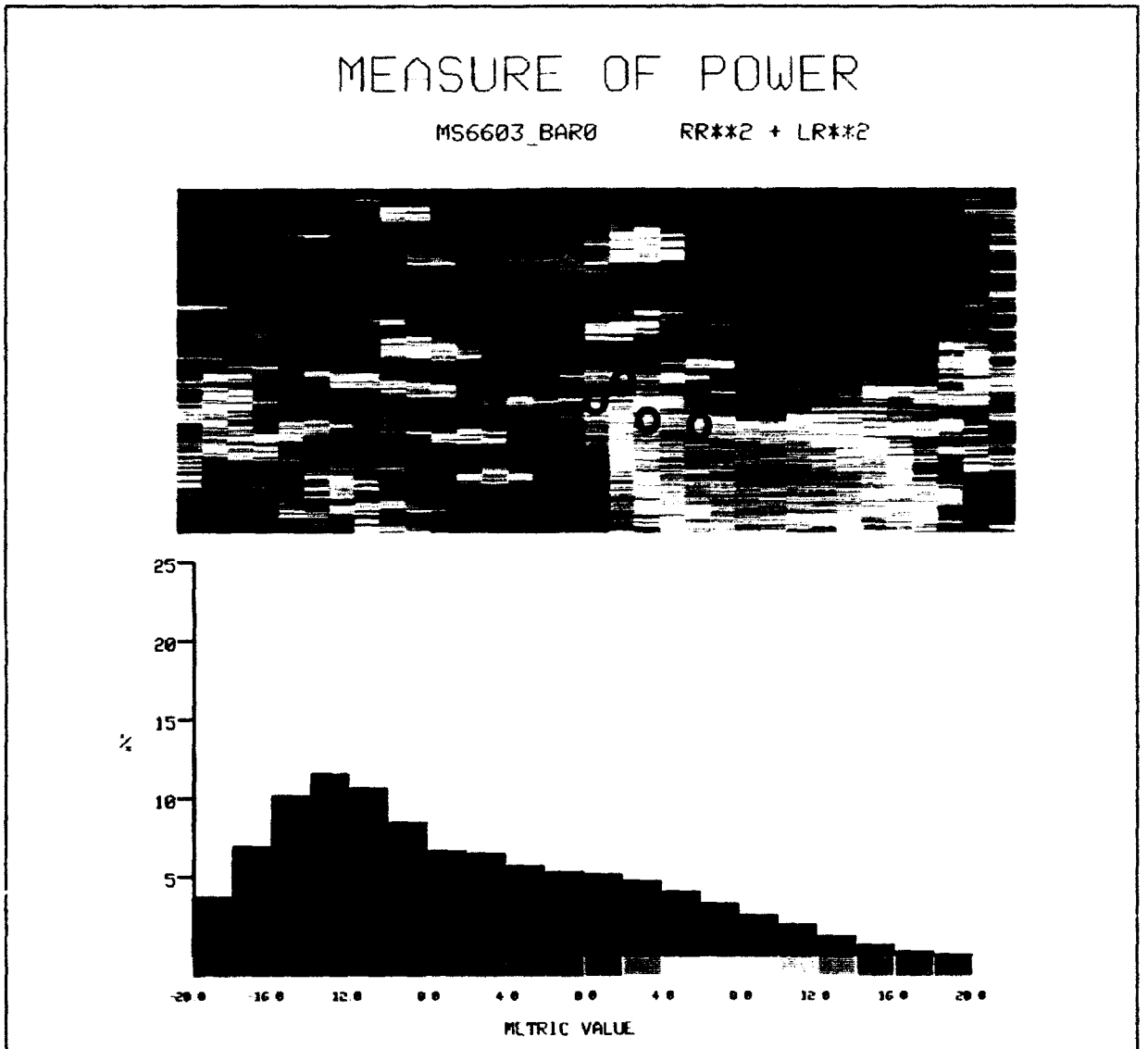
a. Slant range-azimuth plot, linear scale

Figure 3. Measure of power returned from test MS6603 (Sheet 1 of 3)



b. Three-dimensional representation, x = azimuth, y = slant range, z = measure of power (linear scale)

Figure 3. (Sheet 2 of 3)



c. Slant range-azimuth plot, logarithmic scale

Figure 3. (Sheet 3 of 3)

3 Metrics Approach To Quantifying Target-Like Features

Philosophy

Aided Target Recognizer (ATR) algorithms for modern sensor systems often begin the process of locating and identifying targets in cluttered backgrounds by eliminating substantial portions of the data that are not likely to contain real targets. This process, referred to as segmentation, usually involves the application of a gross (in a spatial sense) signal-to-clutter filter to coarse range profiles and assumes that man-made metallic targets produce strong returns compared with the natural backgrounds. Only after areas having high probabilities of containing a target(s) have been identified do the algorithms then process data at its finest spatial resolution to complete the search and identification procedure. To answer questions about the ability of natural target backgrounds to produce target-like features, one must not throw away any data. Thus the approach taken in these studies is to generate and retain the finest spatial resolution information that is available from these data.

It would be an enormous task (as well as an infringement on the proprietary nature of many sensor system algorithms) to apply all of the target feature algorithms to these data that are currently being used or being considered by ATR developers. Therefore, a decision was made to apply only the most commonly used and simplest features as a first step in tabulating statistics on the occurrence of target-like signatures in the MSFD test site backgrounds.

The basic approach, then, to quantifying the occurrence of target-like features in natural backgrounds is to first select several simple, widely accepted target filters, or metrics, for further study. These metrics are then applied to the finest resolution range profiles for a representative set of test site data, and the results are tabulated and stored in data files for further processing. Color graphics displays of the results are generated in range-azimuth space for qualitative interpretation. The metric, or filtered, data files are then analyzed using statistical routines, to determine moments of the histograms and other relevant information such as the relative positions of target data within the filtered data histograms. This latter step requires placing range windows over the known target locations and eliminating the target-related data from the background data to develop background-only histograms or to simply quantify the target signature with respect to the background.

Target Feature Metrics

Following numerous discussions with sensor developers, four simple target feature metrics were selected for application to the MSFD fine-range resolution test site data files. These are listed in Table 2 along with some comments about their general applicability. Even though the amplitude metric does not require any additional data filtering, it proves to be a strong indicator of target presence; as long as all of the test site data sets are properly range corrected, amplitude measurements from different sites and backgrounds can be compared.

Table 2
Simple Target Feature Metrics

Metric	Definition	Comments
Amplitude	Measure of power for each fine-range resolution cell.	Appropriate for range corrected data. Most useful for quick-look, hot spot identification.
Signal-to-Clutter (S/C)	Ratio of average measure of power in a number of fine-range cells forming a target window to the average in a number of similar-size clutter windows. One buffer window is skipped on either side (in range) of the target window.	Data need not be range corrected if clutter window is not too large. Typical applications are region-of-interest identification and target-size S/C for detection.
Variance	Variance of signal (not measure of power) within a window of fine-range resolution cells. $$\frac{n\sum x_i^2 - \left(\sum x_i\right)^2}{n(n-1)}$$ where x_i is the signal (voltage) amplitude returned from the i^{th} fine-range cell.	An indicator of the presence of one or more strong scatterers. Data need not be range-corrected.
Polarization Ratio	Ratio of total measure of power in the left receive, right transmit channel to the power in the right receive, right transmit channel.	Man-made objects should exhibit strong, double (even) bounce behavior. Relatively smooth terrain should have strong, single (odd) bounce characteristics. Foliage should be neither. Large tree trunks and rock outcroppings are expectec to cause problems.

There was some concern regarding how many range-resolution cells should be included in each metric. For example, the signal-to-clutter metric consists of a target window, a buffer window on either side of the target window, and a number of clutter windows outside of the buffers. After much experimenting with the size of these windows, a somewhat meaningful filter size was chosen that includes a 2-m target window, one 2-m window on either side, and four 2-m clutter windows outside of each buffer. Although this may not be the optimum arrangement from a sensor developer's perspective, it formed a reasonable tradeoff between spatial resolution and metric amplitudes. Larger size windows appeared to do nothing more than smear the results. Other filter sizes included a 10-m window for variance calculations and a 2-m window for calculating the ratio of even to odd polarization returns.

The procedure for applying each target feature metric (except for amplitude) was to set the filter at the shortest range for each azimuth, calculate the value of the metric, and insert that value into the fine-resolution cell at the middle of the filter. The filter was then moved out in range by one fine-resolution cell and the calculation performed again. This was repeated for each azimuth until the filter "bumped" into the farthest range cell. In this way, some data is lost at the near- and far-range edges of the range-azimuth data set.

Representative Results

Range-azimuth displays

Figures 4-7 contain graphics display results of the application of each target feature metric to the same test discussed previously, MS6603. Each figure contains the slant range-azimuth representation in both linear and logarithmic scales along with a crude histogram. Open circles added to the logarithmic displays approximately coincide with the locations of man-made targets at the test site.

Several observations are in order at this time.

a. Of the four different representations of target feature metrics, only the polarization metric displays a log-normal distribution of terrain signatures. Power returns from natural terrain are often assumed to be distributed log-normally, but the power returned from this test site is most assuredly not log-normal. This observation, which is generally true for the other test sites, is probably due to a combination of low-grazing angles, relatively sparse vegetation, and the presence of small hills and depressions that result in numerous "shadows" within each test area.

b. Returned signal strength and the amplitudes of filtered data alone are not enough to ensure the detection of man-made targets. An examination of all of the MSFD data reveals that if one knows where these targets are located, the data will often show a strong signature at about that point in space; but other numerous strong features appear to be caused by either the terrain or by man-made clutter within each test site. As for man-made clutter, a consensus exists among MSFD participants that all clutter was not adequately logged, and this study was initiated too long after the demonstration to gather any reliable information by revisiting the site.

c. The polarization ratio concept is of no value whatsoever as a means of separating man-made objects from natural backgrounds. After some reflection on this question, it appears that even if one had an ideal target-size double-bounce object within the radar's instantaneous field of view, its effect on the returned signal would still be minimized because of the fact that the volume in space occupied by a fine-range cell and the half power beam width of the radar is large enough to result in a volume averaged response that is essentially depolarized. For this test case example, the half power beam width covers an arc with nominal length of over 30 m. The same argument could be made to account for why so-called target amplitudes are not greatly above those of the natural background in many test cases.

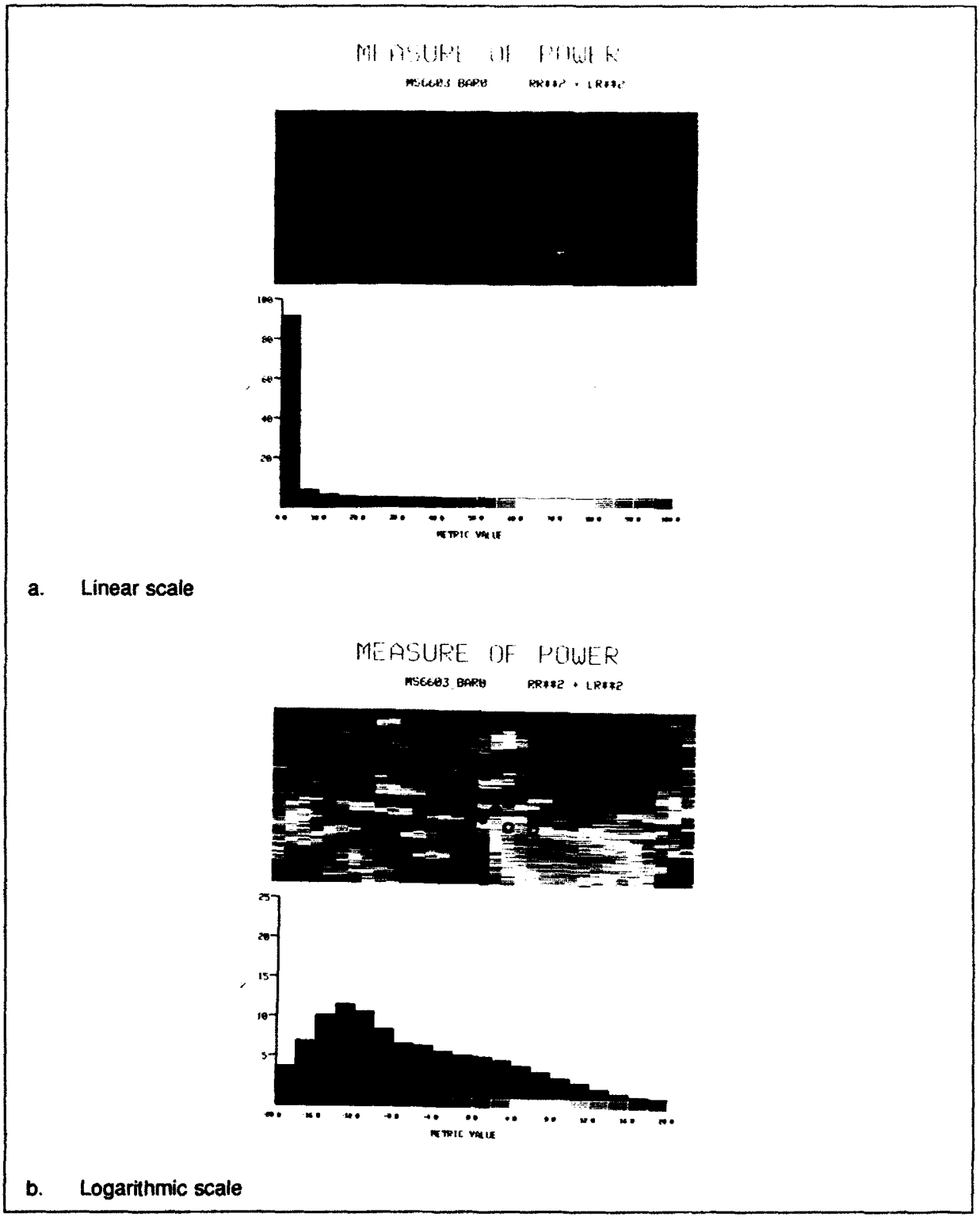
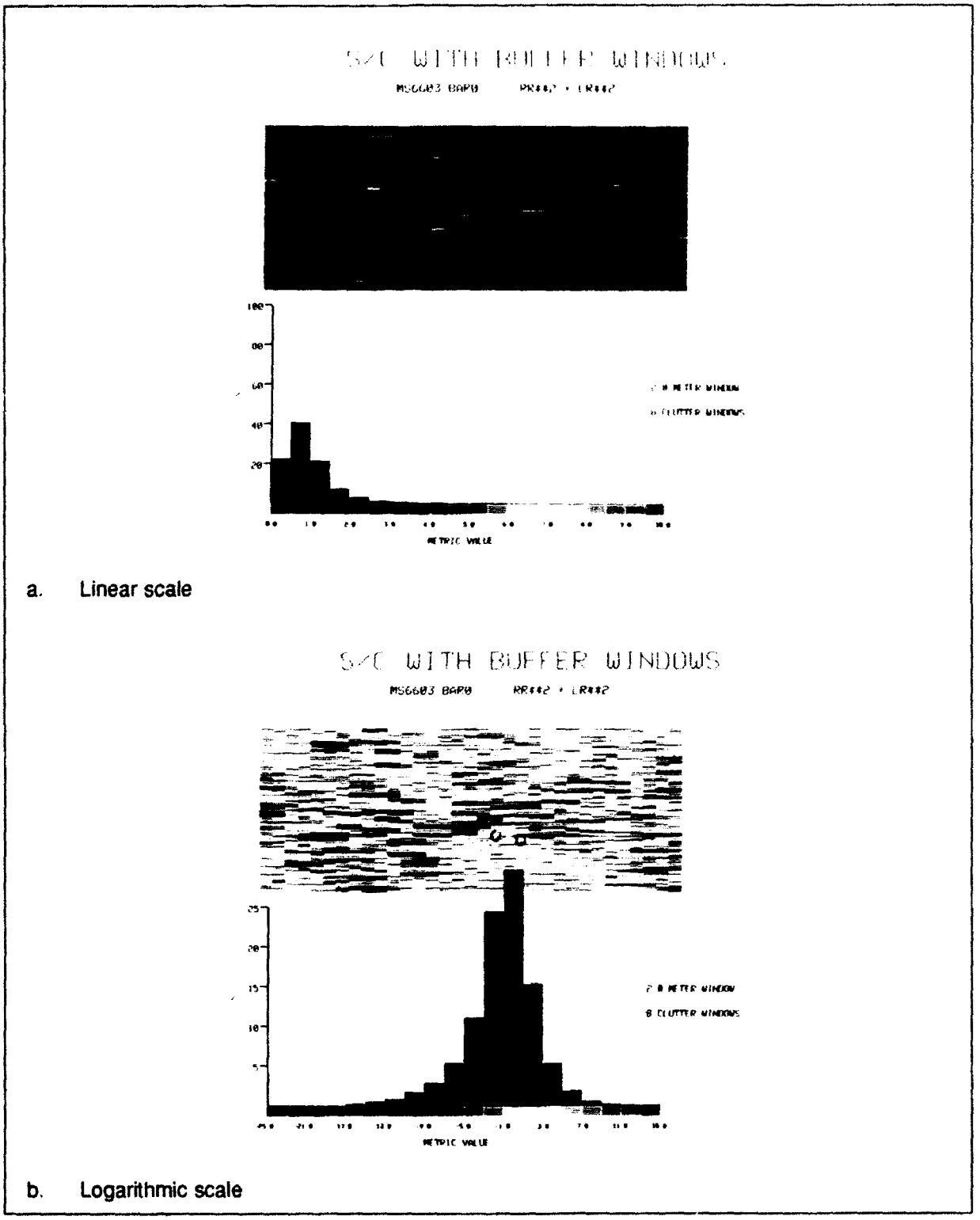


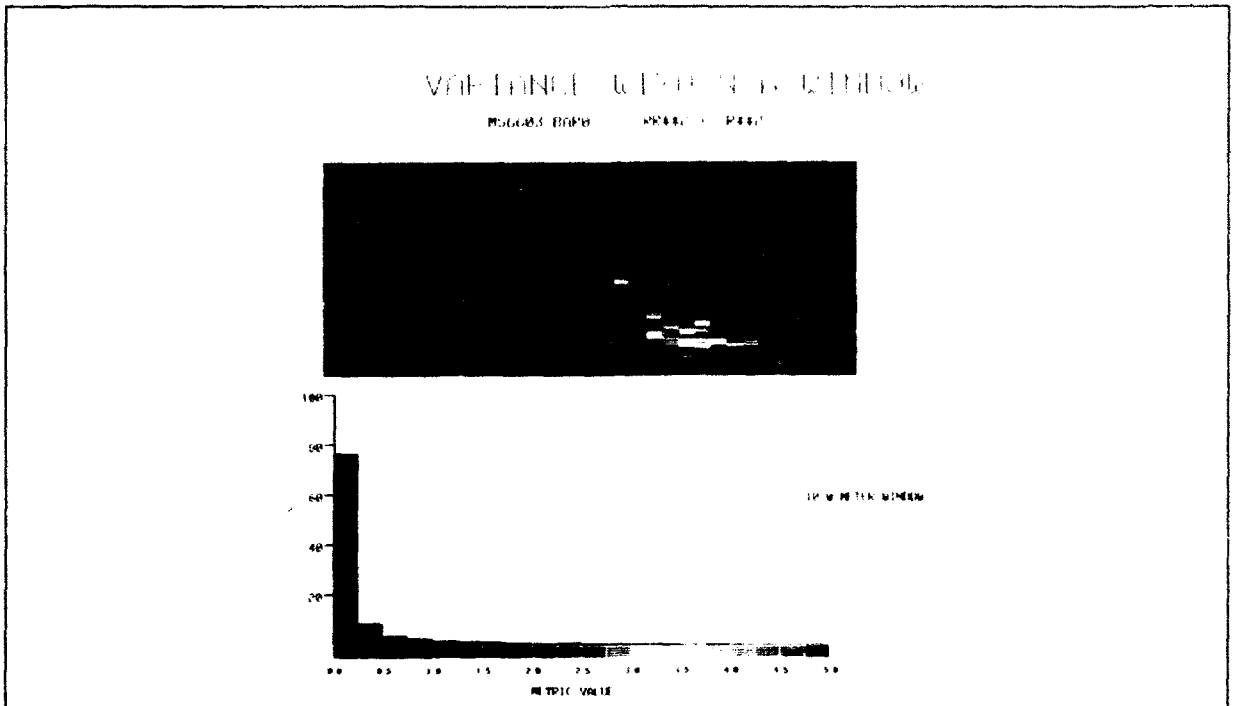
Figure 4. Range-azimuth displays of the "measure of power" metric, MS6603



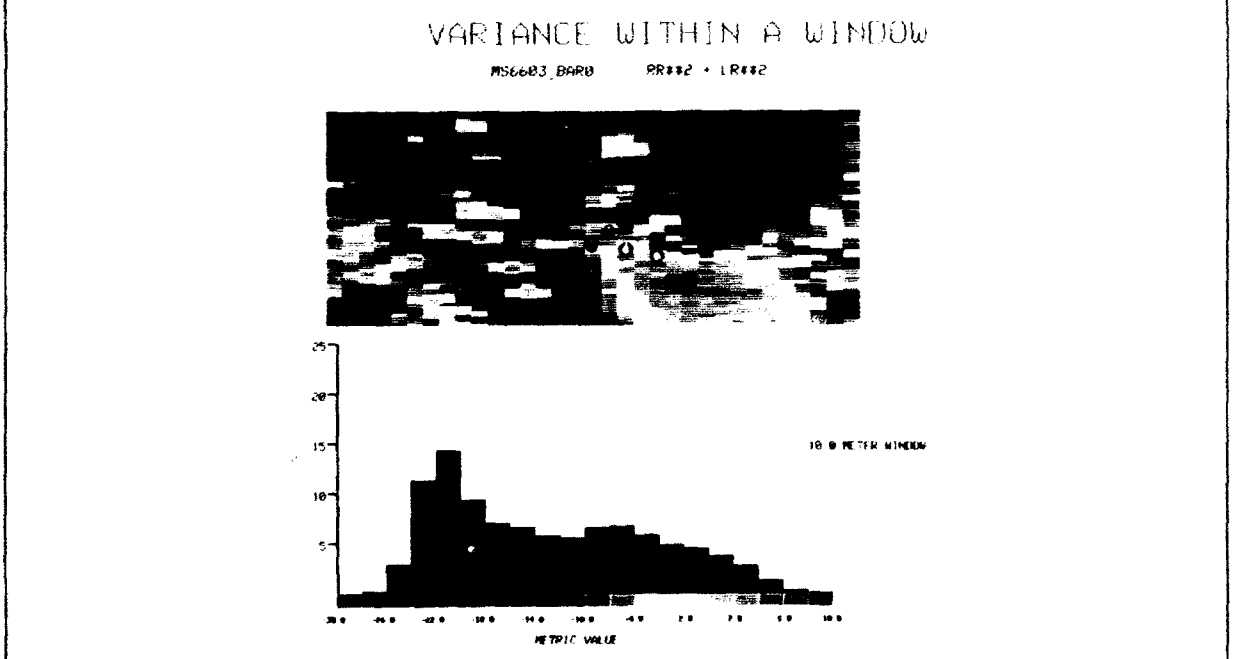
a. Linear scale

b. Logarithmic scale

Figure 5. Range-azimuth displays of the "signal-to-clutter" metric, MS6603

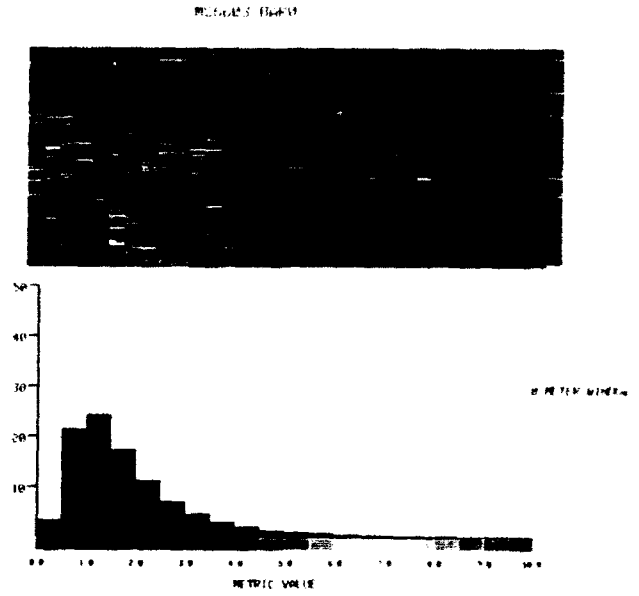


a. Linear scale

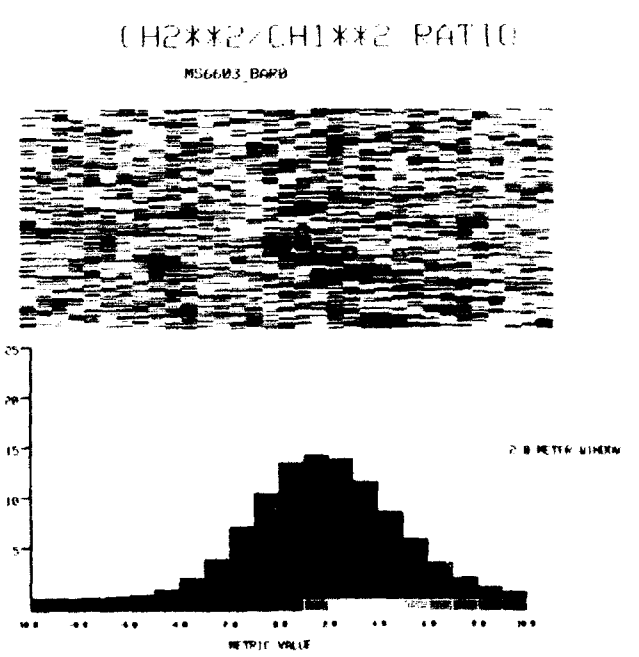


b. Logarithmic scale

Figure 6. Range-azimuth displays of the "variance" metric, MS6603



a. Linear scale



o. Logarithmic scale

Figure 7. Range-azimuth displays of the "polarization" metric, MS6603

d. While all of the target feature metric examples shown are for MSFD data that are derived from sums of squares of measured voltages for the two different polarization combinations, the statistics will show that neither of the polarization combinations by themselves consistently performed better than the other when looked at from the target feature metrics perspective. This is a reflection of observation *c*.

Range profiles

Consider now another visualization of these target feature metrics, this time as a trace of the metrics along a given azimuth mark. Several of these range profiles are shown in Figures 8-10. It is obvious from the logarithmic representation of power for test MS6603 shown in Figure 4 that a man-made target should be quite apparent along azimuth mark 18 (the 18th vertical strip counting from the left); those profiles are shown on Figure 8. The apparent target position is indicated by the dashed line. Another target should exist along azimuth mark 21, but it appears to be obscured by strong foreground returns. Azimuth mark 21 profiles are shown on Figure 9. Finally, there are numerous significant returns from azimuth mark 24 where there should be no targets of interest. Its profiles are shown on Figure 10.

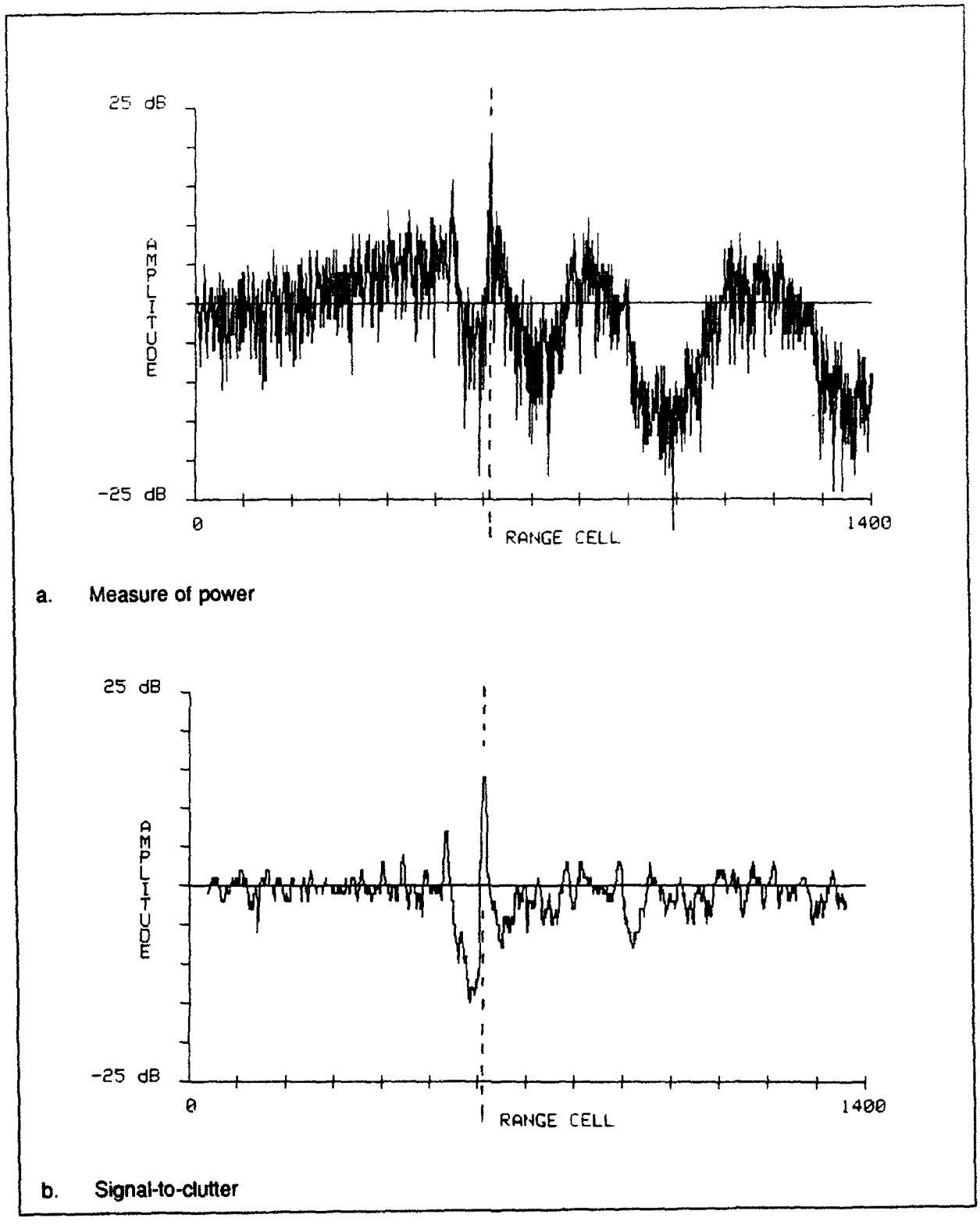
As with the two-dimensional maps, several observations are in order relevant to these one-dimensional traces.

a. With respect to the target in azimuth mark 18, its measure of power does exceed all other returns along that profile. The other significant return at about range cell 530 is simply a spillover from the target located in azimuth mark 17. At this point it is impossible to speculate as to the significance of the shape of this profile because not enough ground truth data exist to indicate whether the reduced returns on either side of the target are due to the shadowing effects from adjacent targets or dips and rises in the local elevation, or whether this is just a strong target signature superimposed on a flat terrain return. A closer examination of the target profile would have to deal with higher order target detection algorithms, anyway, and that was not the objective of these studies.

b. Regardless of what influences the power profile data, application of the signal-to-clutter metric to a strong isolated return has to produce the characteristic profile shown on part (b) of the figure. For this target, under these test conditions, nothing in the background dominates the signal-to-clutter space quite like the real target. There is one minor anomaly at about range cell 900 that requires more ground truth than that available to explain.

c. By its very definition, a calculation of the variance of a signal within some window is a measure of how extreme the variations in the signal are. One is therefore not surprised to see the strong signature in variance space because of this rather isolated and dominant target. Large shadows will cause the severe depression of the variance metric seen between range cells 900 and 1100.

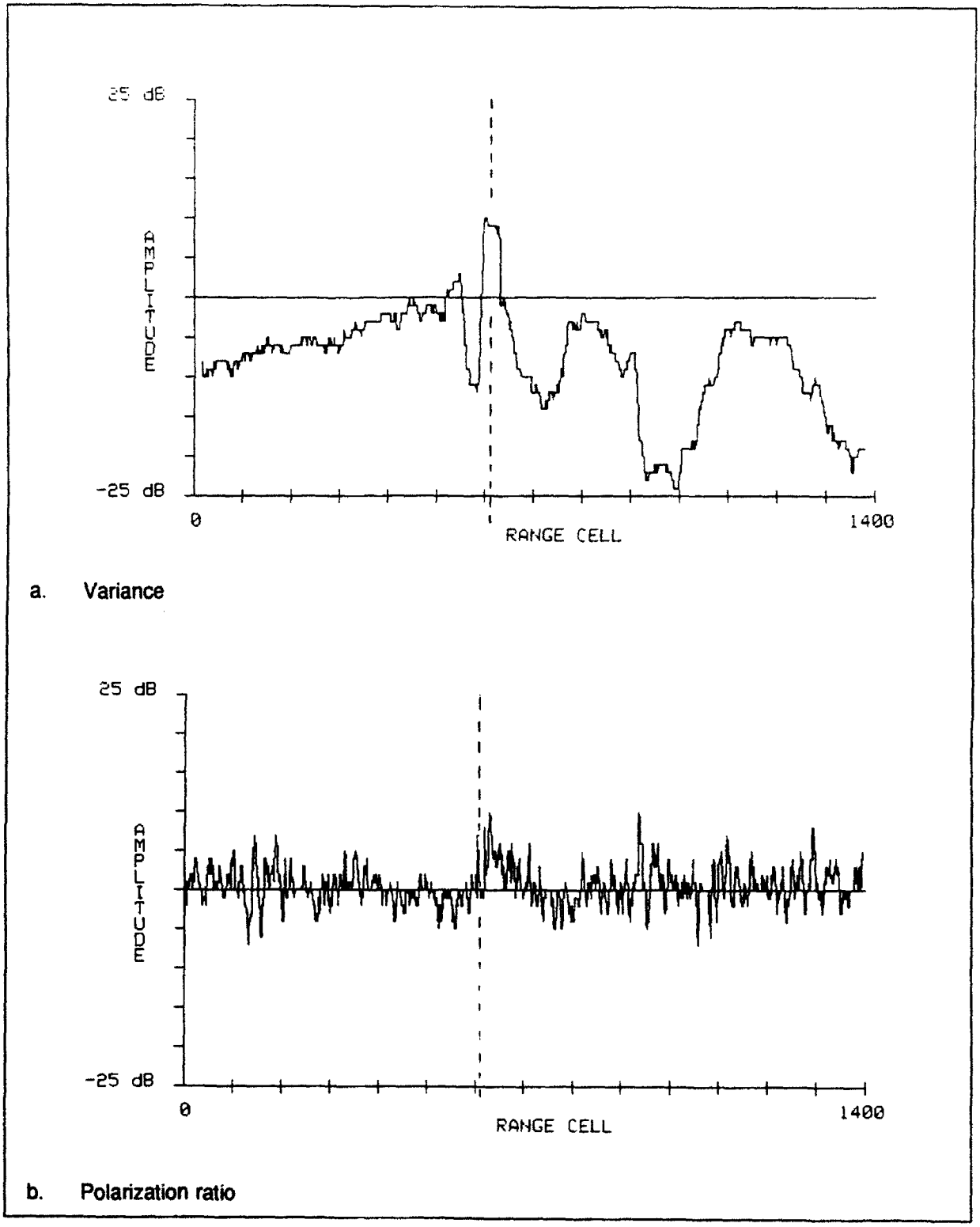
d. Even for the well-defined target in azimuth mark 18, the polarization metric did not reveal any anomalies, as expected.



a. Measure of power

b. Signal-to-clutter

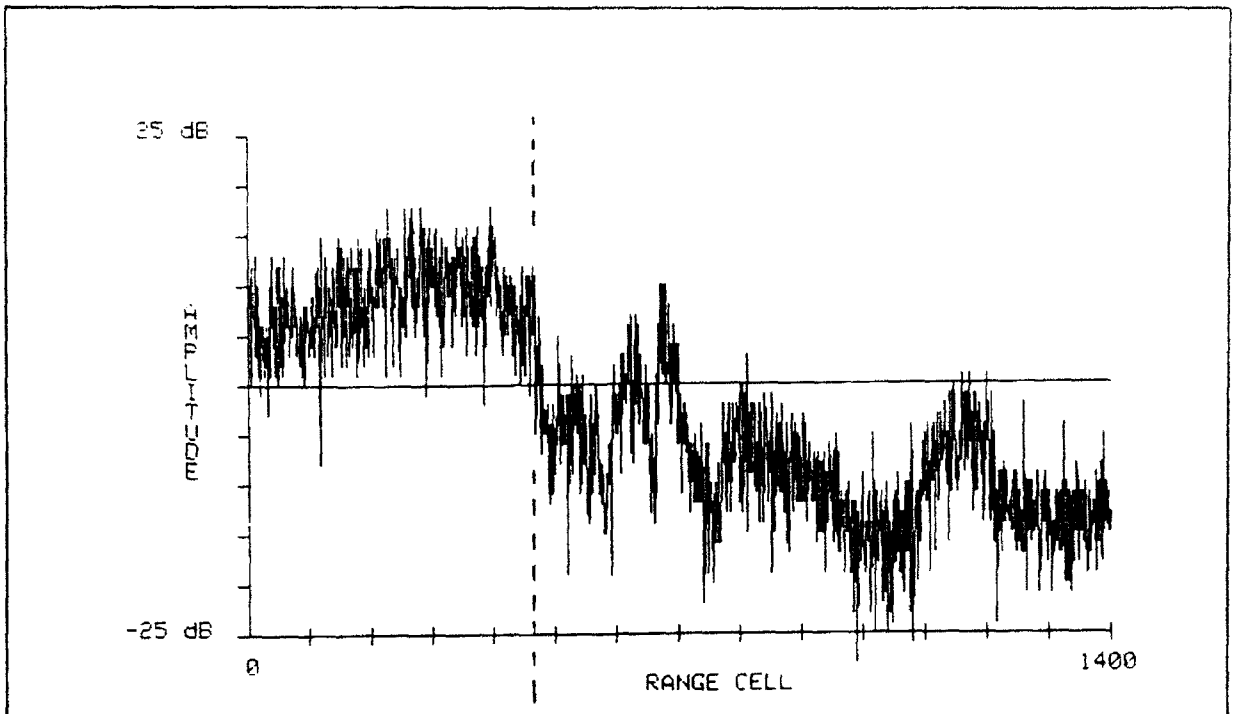
Figure 8. Range profiles for target metrics, azimuth mark 18 (Continued)



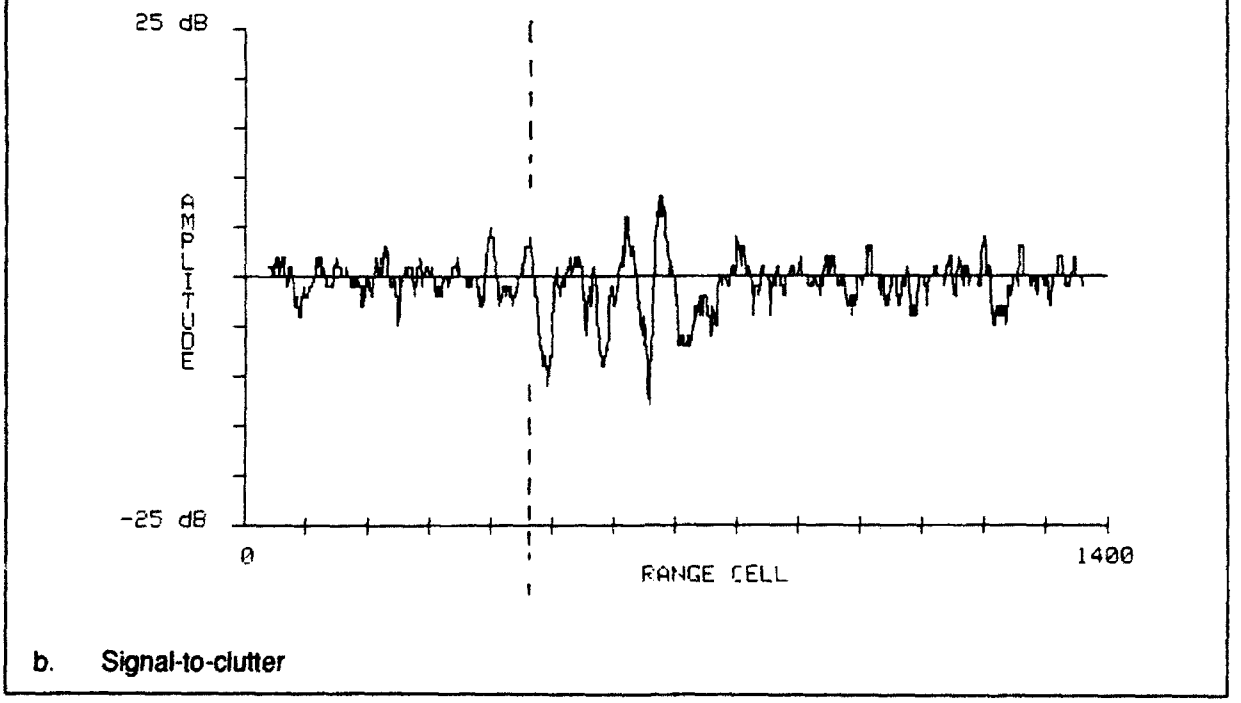
a. Variance

b. Polarization ratio

Figure 8. (Concluded)



a. Measure of power



b. Signal-to-clutter

Figure 9. Range profiles for target metrics, azimuth mark 21 (Continued)

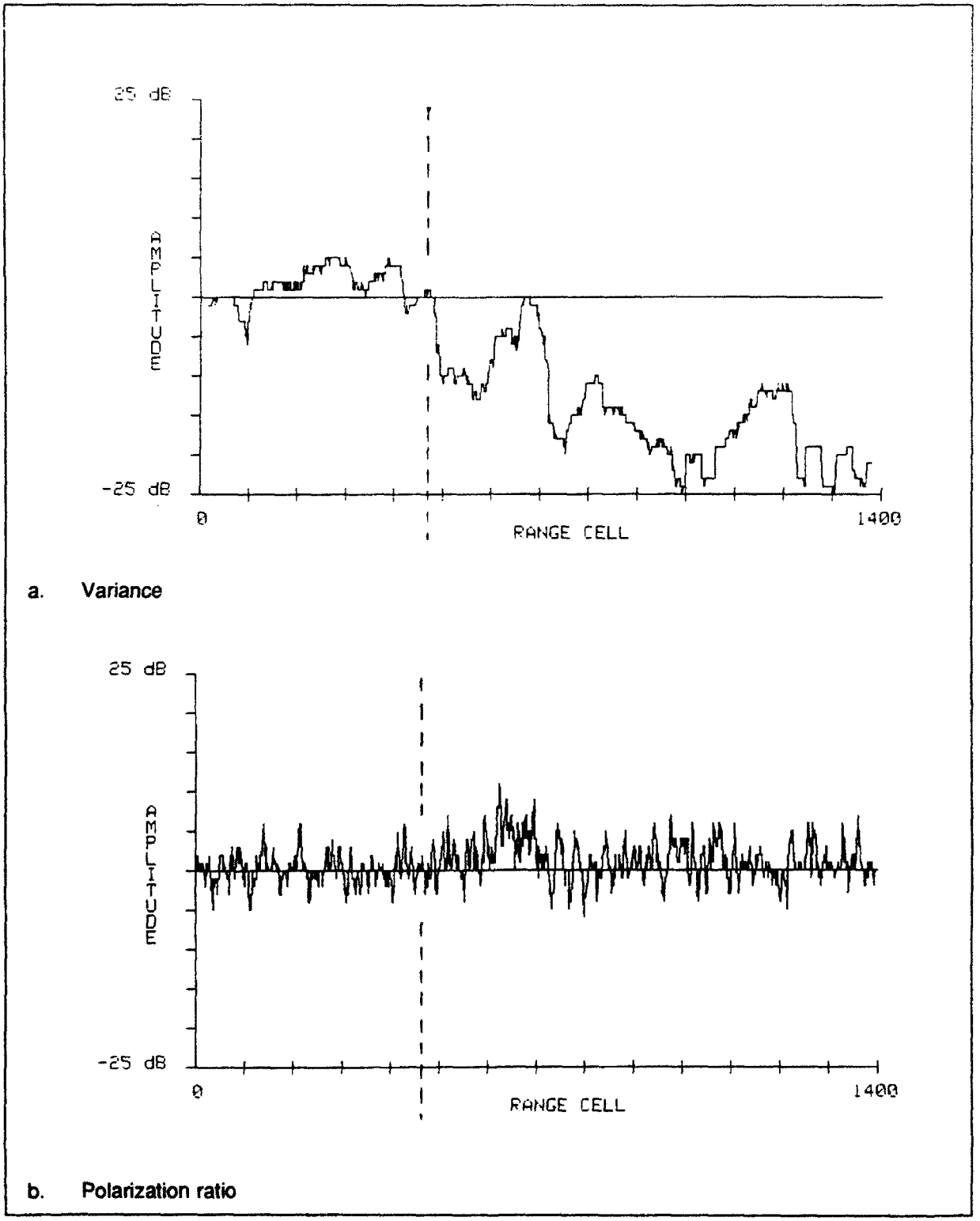
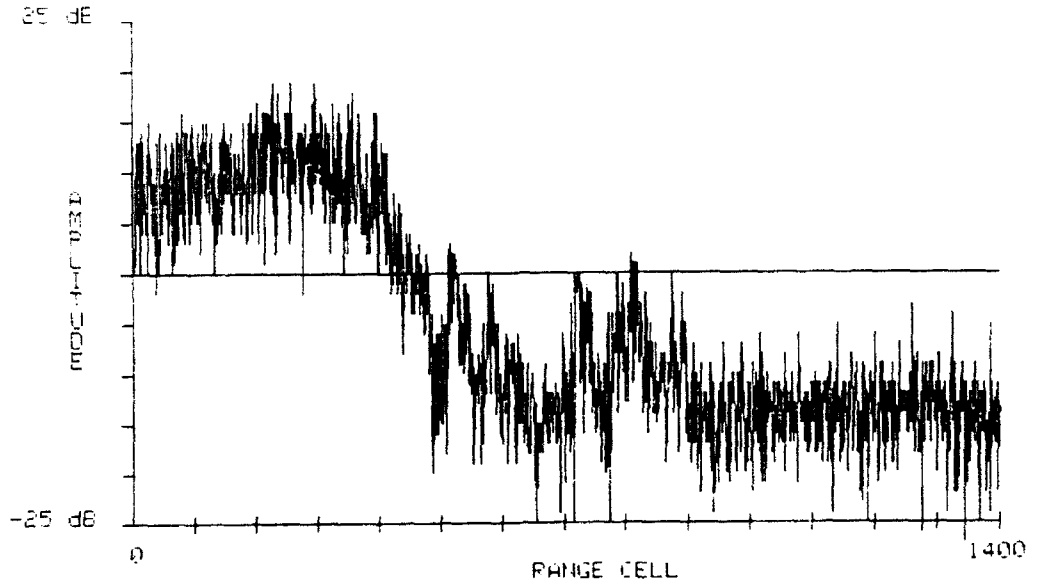
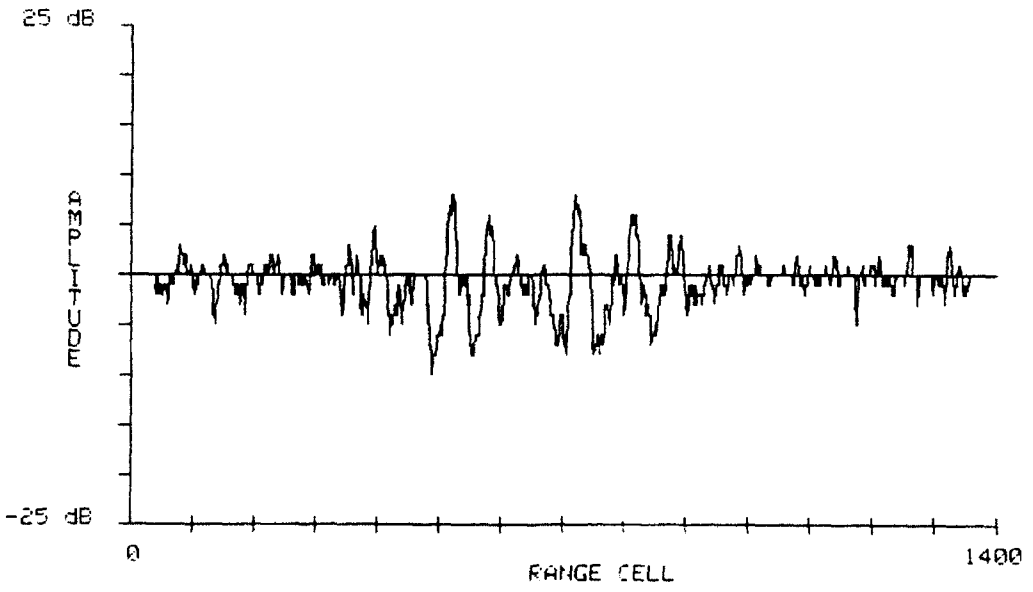


Figure 9. (Concluded)

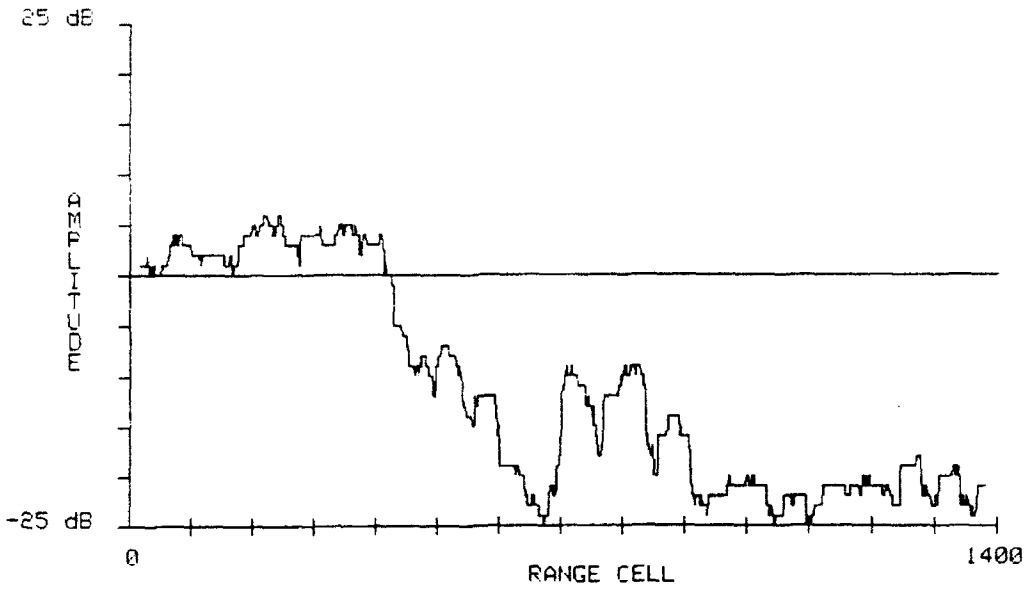


a. Measure of power

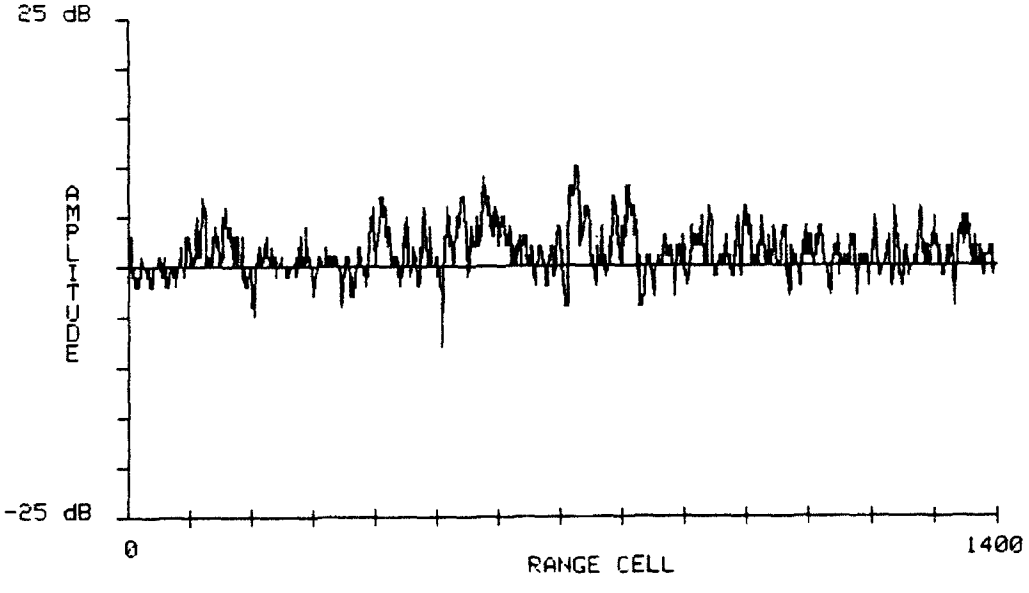


b. Signal-to-clutter

Figure 10. Range profiles for target metrics, azimuth mark 24 (Continued)



a. Variance



b. Polarization ratio

Figure 10. (Concluded)

e. Whereas the strong target signature on azimuth mark 18 was very isolated, the target location on azimuth mark 21 does not stand out in any of the target feature metric profiles. The test summary indicates that this target should have been in the open but was turned at an angle to the radar. In other words, target signatures are not always the strongest signatures on any given profile. In fact, almost everything in the foreground of this target gave stronger returns. It will be shown later that the strong foreground signals can be attributed to terrain geometry and vegetation.

f. Finally, consider the target feature metric profiles shown on Figure 10 for azimuth mark 24. Without further ground truth information, it appears that there are no man-made targets along this profile, but, at least in the signal-to-clutter domain, there are strong indications of target-like features between range cells 500 and 900. The very elevated power measurements within the first 400 range cells are uniformly high and produce no target-like features. It appears that anything within the natural terrain that could cause a short range jump in power return could produce a target-like signal-to-clutter response. Within the terrain at Fort Hunter Liggett, such behavior could be the result of the isolated trees at each test site.

Statistics

During early discussions with the AATD staff, it was suggested that by taking a hard look at a good set of existing data and applying the metrics analysis approach, a quantitative way might be developed to characterize a given test site within a given portion of the spectrum. After a great deal of effort was expended on this task, the conclusion to date is that a simple, clean way of quantifying a test site through the "eyes" of a given radar system has not been found. There are, however, hints that such an approach might still work. Ideally, what would be required is well-documented data from other geographical locations that were collected using the same sensor system. Such data do not exist. Nevertheless, the following observations derived from statistical analyses may prove useful for future measurement and analysis programs.

Global target prominence. Literature on imaging ATR systems[1] has defined a metric concept which quantifies the conspicuity of a target portion of an image relative to the entire image. This is referred to as a "global target prominence" (GTP) and is measured by determining the percentile location of a target feature value relative to the histogram of this feature for the entire image or for the portion of the image devoid of targets. This is illustrated in Figure 11. GTP is interpreted as the portion of the image less conspicuous than the target for a specific feature. Values range between 0.0 and 1.0. A value of 1.0 indicates that the target has a higher feature value than anything in the image; conversely, a value of 0.0 indicates that the target has a lower value than anything in the image. This concept is directly adaptable to the radar features used in this study.

Table 3 contains average GTP values for each of the radar target feature metrics. The "all data" column represents the average of target prominences when the target data is considered as part of the histogram for each test. The "backgrounds only" column uses histograms for which the target signatures have been masked. What these numbers say is that the targets, in general, are among the dominant features within all of the test sites. However, given the number of fine-range cells

[1] J. Beard, L. Clark and V. Velton. (1985). "Characterization of ATR performance in relation to image measurements," unpublished paper, AFWAL/AARF, Wright-Patterson AFB, Ohio.

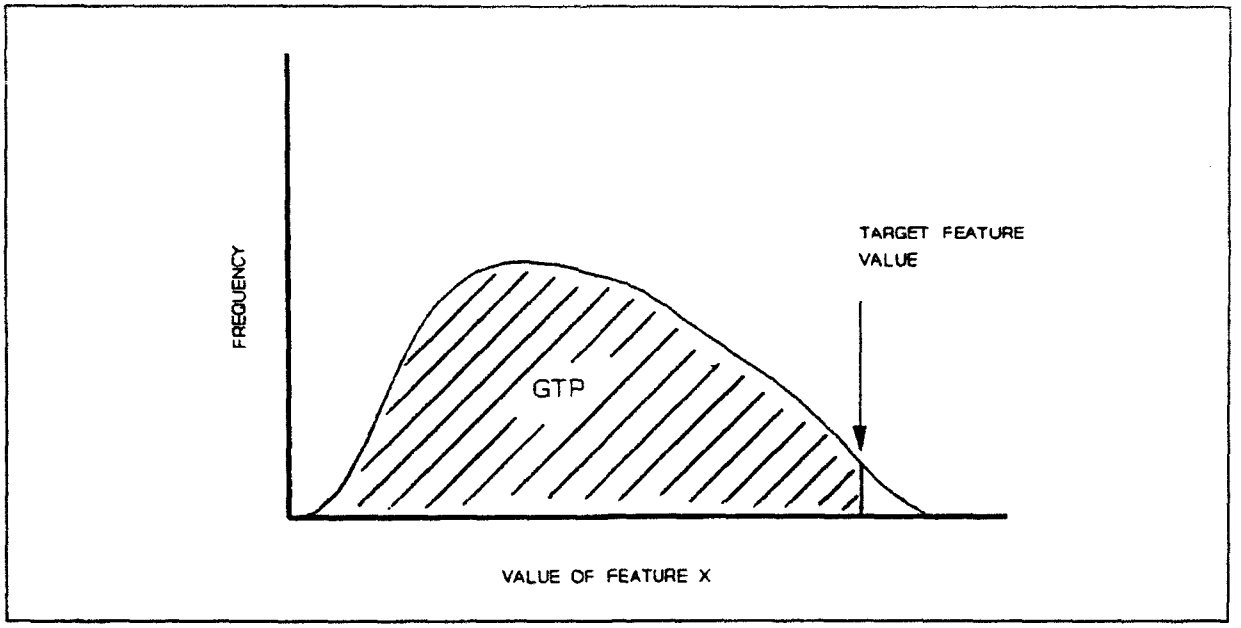


Figure 11. Graphical representation of global target prominence (GTP)

Table 3
Average Global Target Prominence (GTP) of Radar Features

(Based on 88 Targets in 24 Scenes; Total Measure of Power Data)

Measure of Target-Like Features	All Data	Backgrounds Only
Power	0.994	0.994
Signal-to-Clutter	0.990	0.990
Variance	0.973	0.975
Polarization Ratio	0.925	0.925

contained within each test site data set, there are still a large number of other features whose signatures are equally as strong.

Cumulative histogram inferences. One of the most promising approaches to quantitatively characterizing test sites with respect to a given radar sensor was to look for predictable patterns in the histograms of measured and filtered data. The following figures and paragraphs contain some observations regarding the cumulative histograms of measure-of-power data for all of the test sites contained within this study.

Figure 12 contains all of the MSFD test site cumulative histograms presented on a logarithmic scale. There is no obvious clustering of these curves that could be attributed to something unique about the terrain at different sites within Fort Hunter Liggett. In fact, disregarding the two anomalous responses from tests MS6701 and MS5803, all of the remaining test results for power measurements are quite closely clustered. There are, however, a couple of observations worth noting.

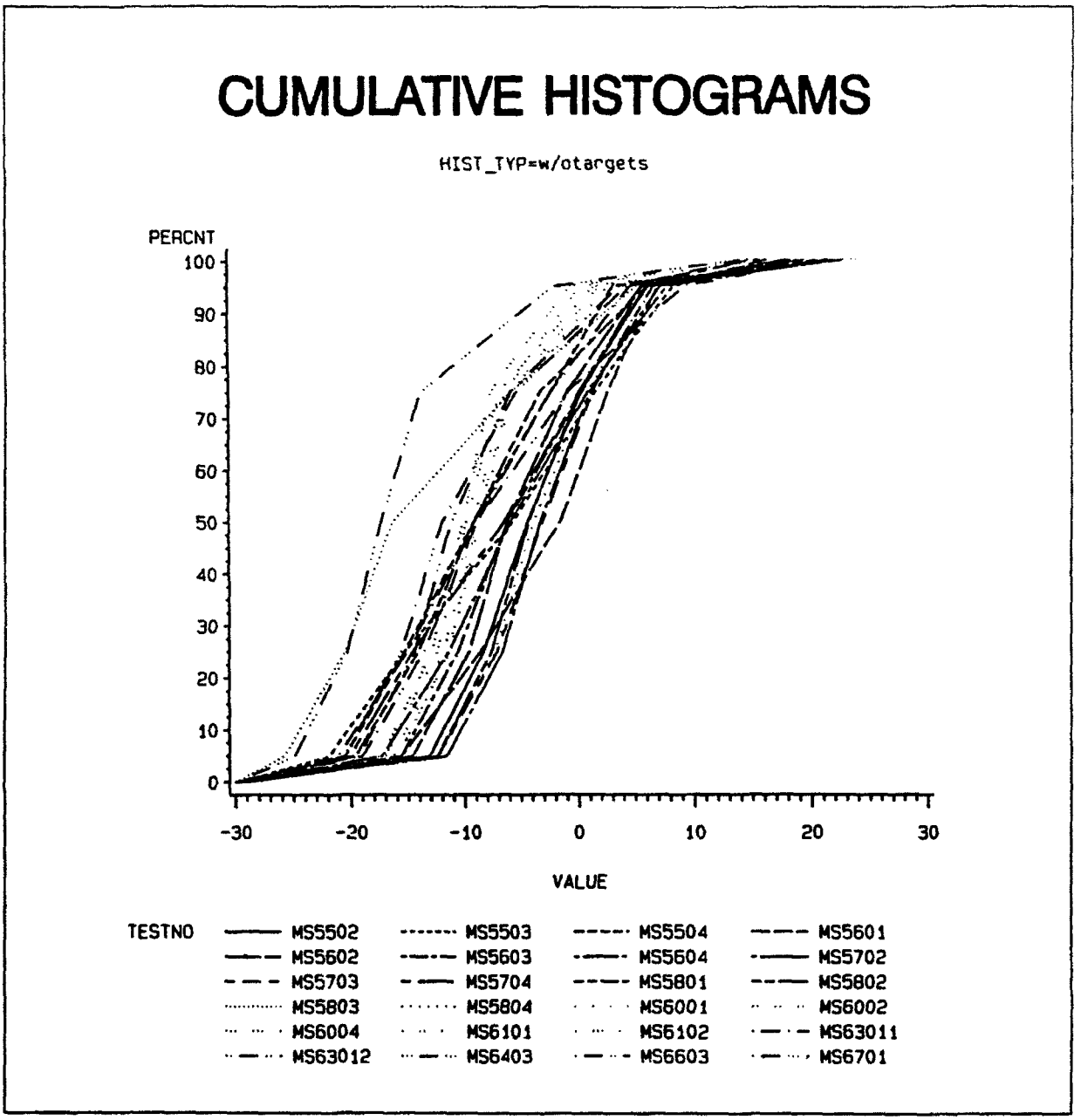


Figure 12. Cumulative histograms of power data (all tests)

Figure 13 is another plot of cumulative histograms for test sites whose average range is different from all of the others. In a gross sense, increasing range to the test area appears to cause a shift to the right in the cumulative histogram. The net result of such a shift is to decrease the extremes of contrast within the test area that could, in turn, lead to less apparent target signatures. All of this could be explained by the large range cell volume averaging concept discussed earlier. When one combines a strong target signature with a larger number of worker background signatures, the resulting average tends toward the weak background levels.

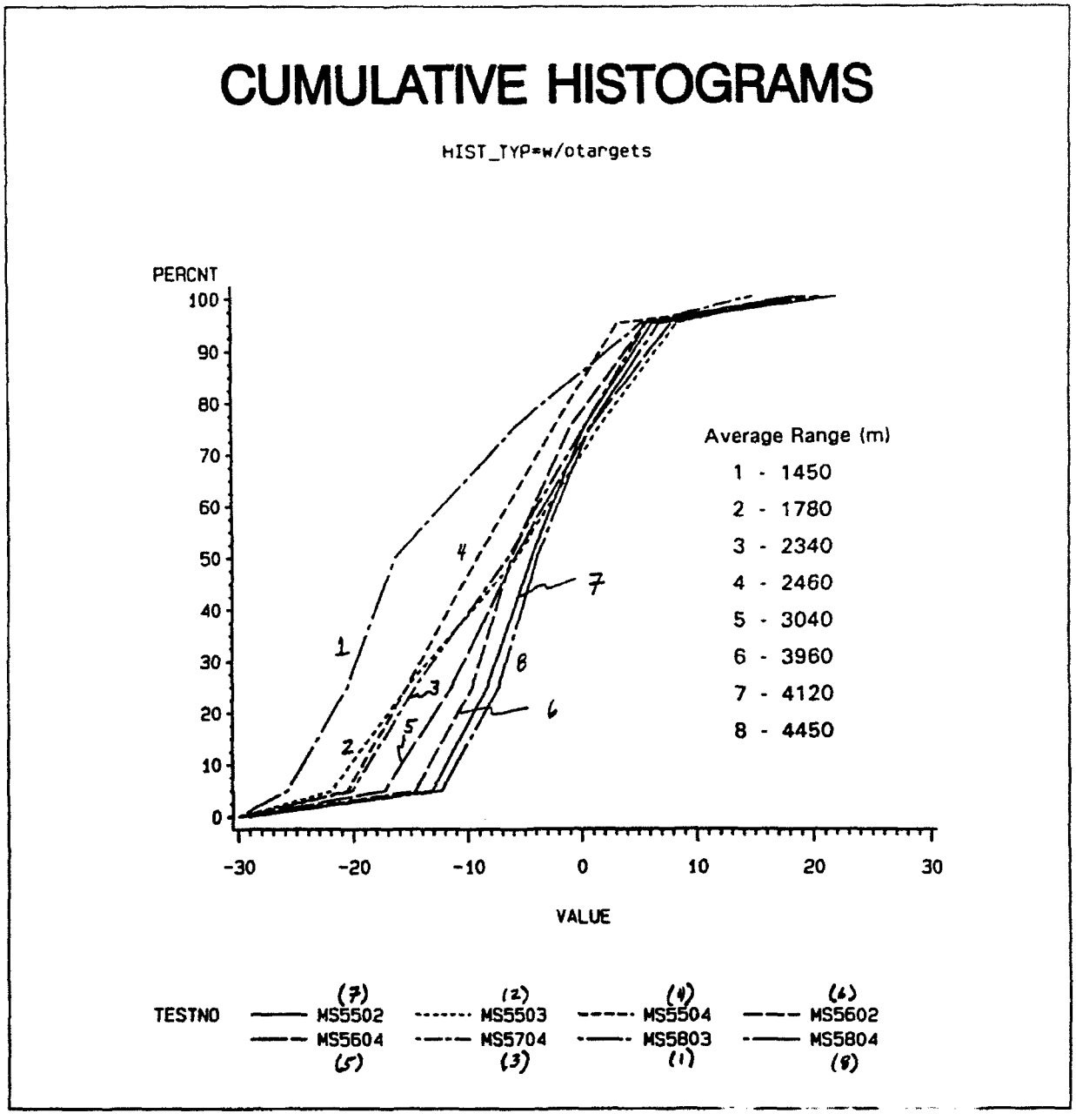


Figure 13. Cumulative histograms showing range effect

The final observation in this section on statistical perspectives is that the data collected at Fort Hunter Liggett do appear to be quite repeatable. Figures 14 and 15 show the histograms of tests whose target arrays were located at about the same position relative to the radar but whose data were collected at different times of the day varying from predawn to the middle of the afternoon. This clearly shows, also, that environmental factors such as air temperature and relative humidity changes within reasonable limits have little effect on radar measurements taken during MSFD. There is some temptation to attribute the differences between the histograms shown in Figures 14 and 15 to gross differences in weather conditions, as the data represented on Figure 14 was collected during heavy fog

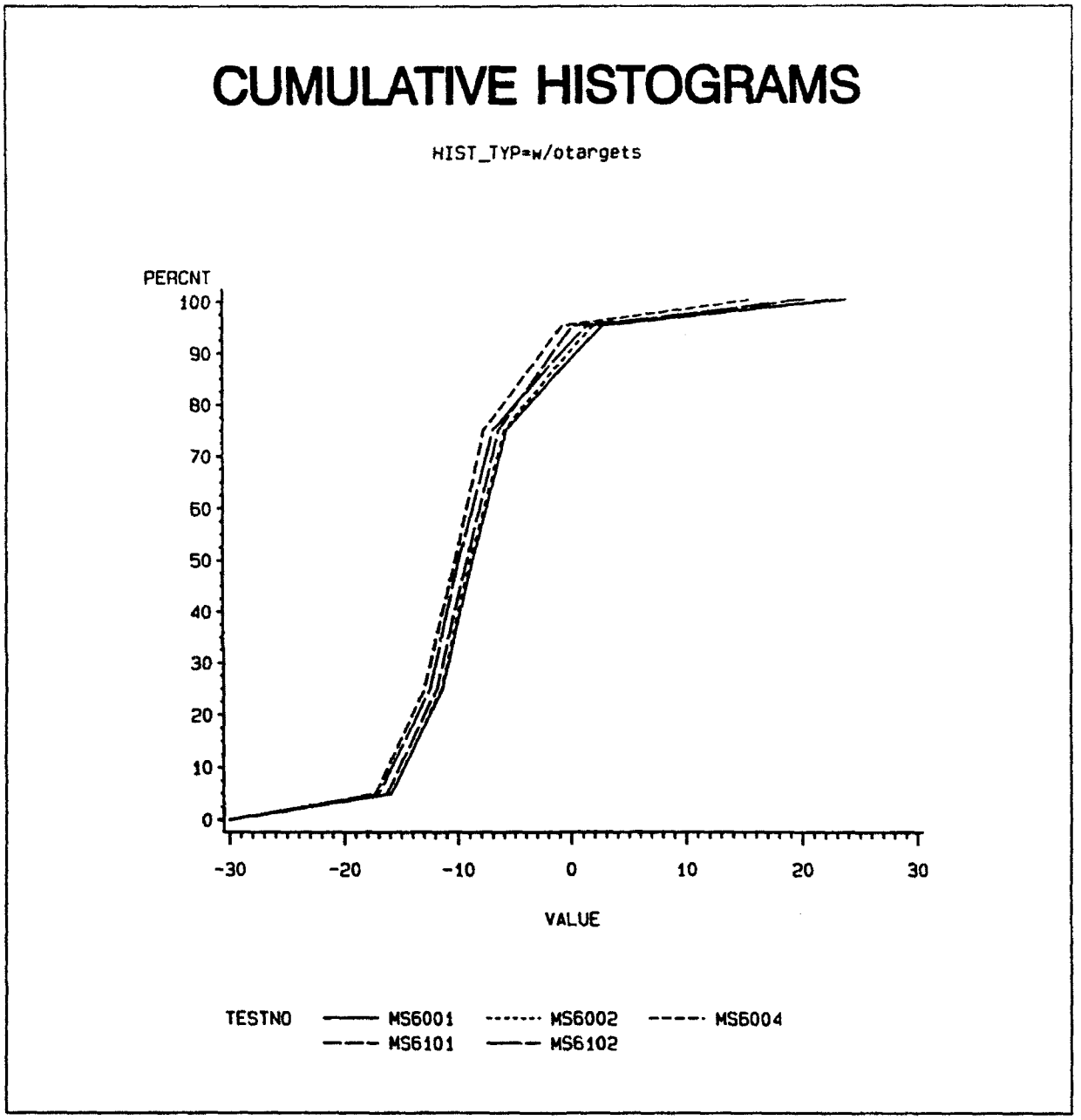


Figure 14. Cumulative histograms showing repeatability (heavy fog)

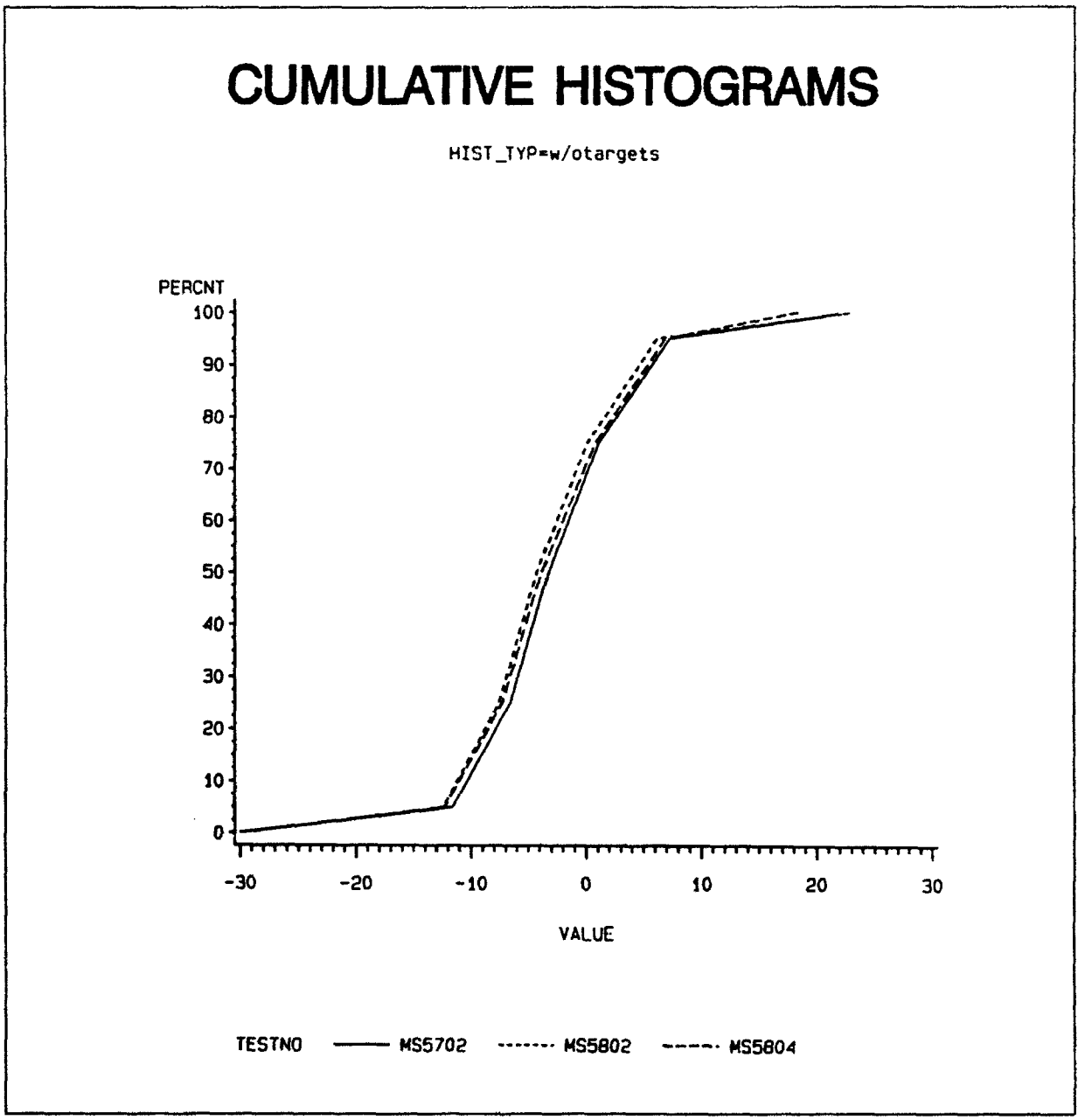


Figure 15. Cumulative histograms showing repeatability (moderate weather conditions)

conditions and those shown on Figure 15 to a more moderate set of relative humidity conditions. However, the magnitudes of the data do not support that contention. Water will tend to absorb and forward scatter the radar energy. If moisture was the controlling factor in the difference between these two groups of tests, then the data in Figure 14 should be shifted to the left of the data in Figure 15, and that is not the case. The range effects noted above seem to be the best argument for the differences.

4 Backscatter Modeling and Discussions of Terrain Effects

A Simple Backscatter Prediction Model

The second approach taken in these studies of characterizing the interaction of the MSFD test site backgrounds with the radar sensors was to develop and exercise a simple backscatter prediction model to qualitatively assess the impact of terrain geometry on measured data. In other words, "How much of the radar return can be predicted by some reasonable knowledge of the test site surface geometry?" This was thought to be a particularly relevant question for the MSFD because of the relatively clean environment of the tests compared with what might exist at test sites in other temperate parts of this country or in western Europe, or even Central America.

The backscatter model developed consisted of the following elements that are schematically drawn on Figure 16. First of all, available 25-m terrain elevation data were converted into a three-dimensional finite element surface of triangular facets for which vectors normal to each facet are easily computed. Next, a point light source was positioned at the location of the radar system (either the high site or the low site), and the angle, ϕ, between the light source and the normal vector to each terrain facet was computed. Under the assumption of Lambertian scattering, the intensity (or power) of the backscattered light was calculated to be proportional to the cosine of this angle.[1] A ray-tracing scheme was developed to ensure that terrain facets that could not be seen by the radar would not produce a returned signal. Because none of the available Geographic Information System packages available at WES possessed a finite range point light source simulation capability, this software package was developed by the first author.

The point light source simulation of a radar is reasonable, because light energy and radar energy are the same physical phenomenon; they differ only in frequency. The Lambertian assumption for scattering is not unreasonable, because at the frequency of operation of this radar system, the terrain surface is certainly rough. Ultimately, the acid test for this model is its comparison with real data. Results indicate a strong correlation between the two.

Representative results for this simple backscatter prediction model are shown on Figures 16-18. First of all, Figures 16 and 17 show the terrain backscatter predictions for the entire areas within which MSFD tests were conducted, with Figure 16 depicting the radar located at the high site (Site 8)

[1] M. Born and E. Wolf. (1980). *Principles of optics*. 6th Edition (with corrections), Pergamon Press, Inc., Oxford, UK.

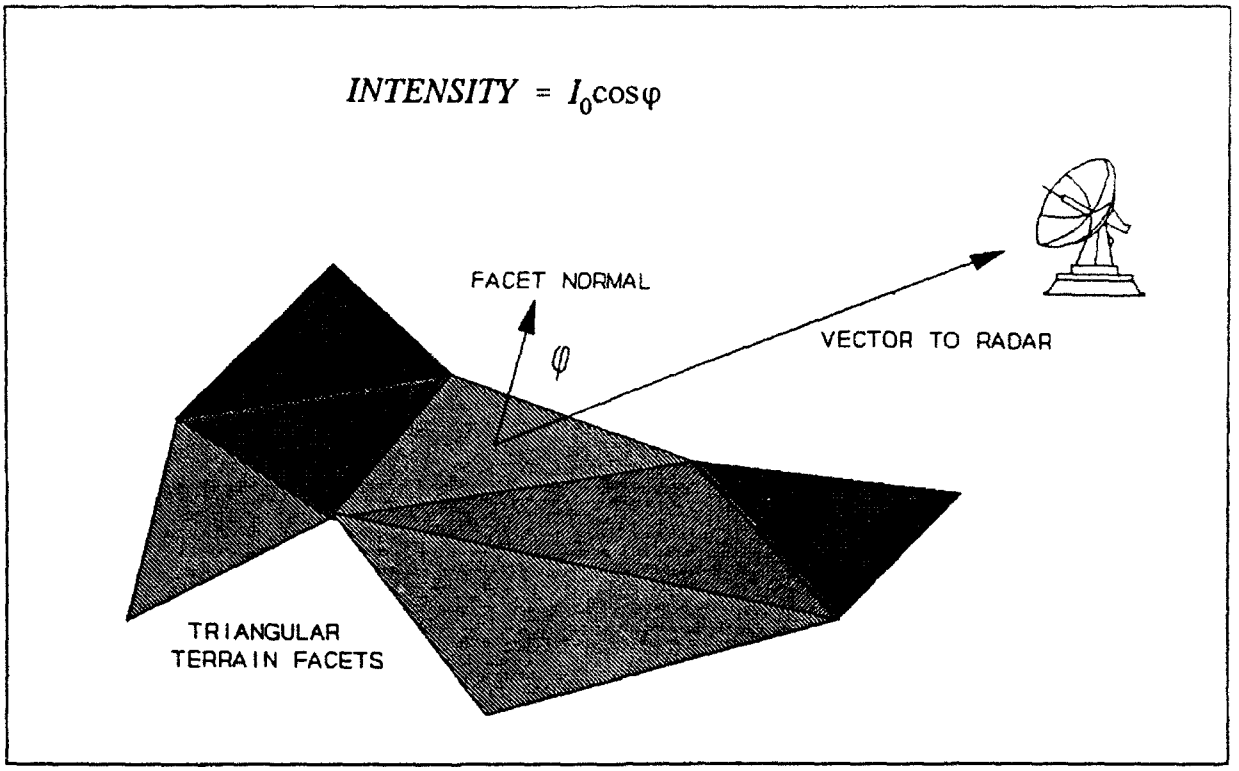


Figure 16. Schematic of the backscatter model

and Figure 17 showing results for the radar located at the low site. There is a black dot on each figure at the location of the radar, and 40-ft contours are superimposed on the figures. The simple model predicts intensities that vary between 0.0 and 1.0 in magnitude. These results were then converted to a 40-db range (which is comparable with the range of measured data) and displayed with the same color bar used for the displays of target feature metric calculations shown in the previous chapter. Even on the gross scale of these figures, it is readily apparent that the model behaves correctly in the sense that steep slopes visible to the radar cause strong backscatter returns and that terrain that cannot be seen by the radar is placed in shadows (white background on these figures to facilitate viewing of the elevation contours).

But the real question is whether or not the model can qualitatively simulate the measured data at each test site, thereby establishing that surface geometry is a major contributor to the test results at MSFD. Returning once again to the same test for which results have already been discussed in previous chapters, Figure 18 contains a comparison between measured data and predicted results using the simple backscatter model. When viewing these images, keep in mind that the measured data were displayed on a rectangular format, while the outline on the simulation results depicts the polar nature of the radar operation. A similar set of figures is shown in Appendix A for each MSFD test. They all demonstrate a strong correlation between predictions based on simple surface geometry and reflectance models and the actual data measured by the radar. For example, note that on Figure 18 strong returns were measured by the radar and displayed on the lower right hand area of the range-azimuth plot that could not be attributed to the presence of any man-made objects. The simple backscatter model predicted the same area of strong returns because of the fact that the terrain surface is nearly normal to the radar at that location. In fact, most of the significant features of the test site radar response are

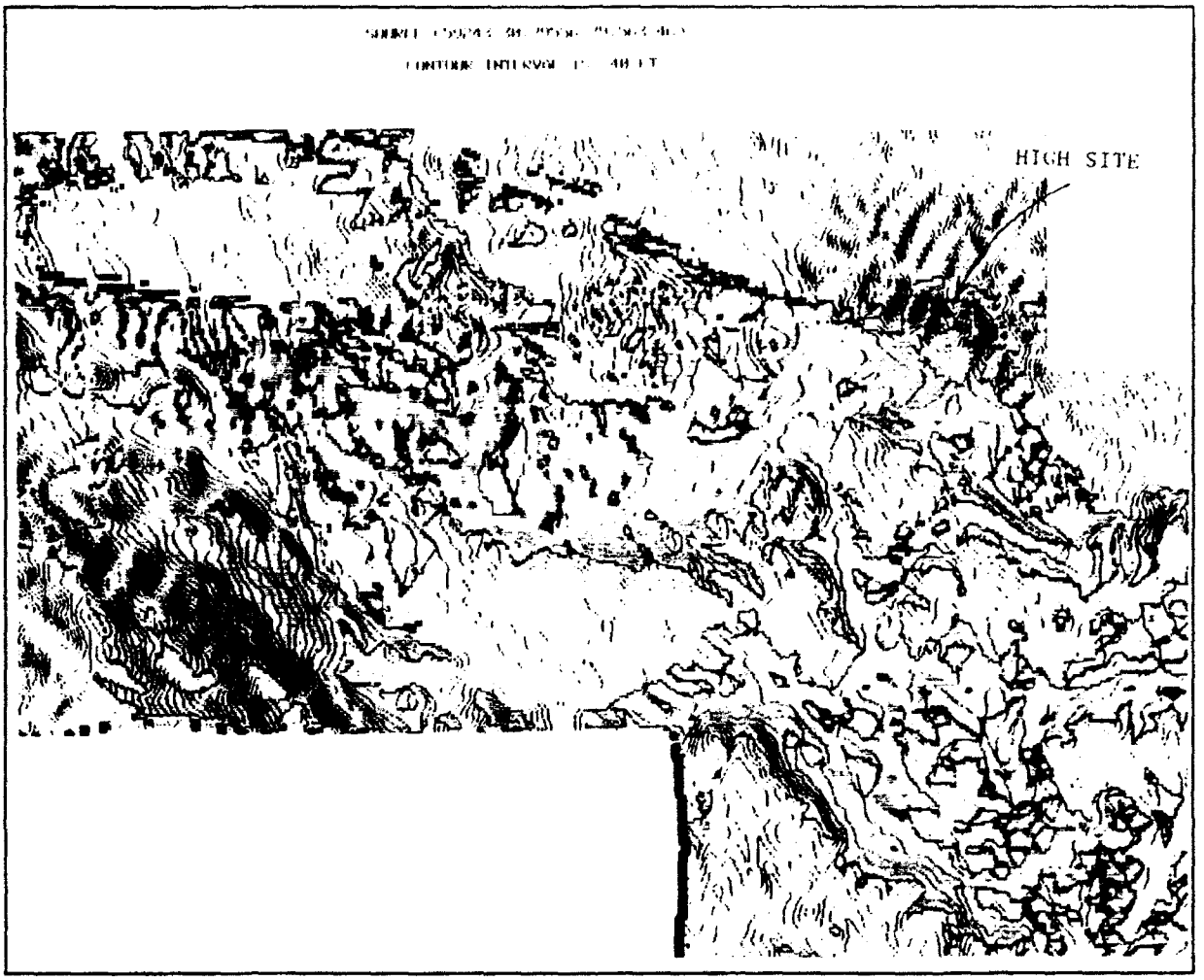


Figure 17. Backscatter model predictions for the high site location

qualitatively simulated by this simple reflectance model. Hill slopes facing the radar are illuminated, and shadows exist where depressions in the terrain have been measured.

Vegetation Overlays

Also shown on Figure 18 is a 10-ft contour map with a vegetation overlay. This was produced by enlarging a set of aerial photographs of the MSFD test areas taken within the next year after the demonstration was conducted to the same scale as the measured data and prediction displays. A contour map was generated on a transparency and laid over the aerial photo. As can be seen by the site photographs contained in Appendix A, the crowns of the trees and other significant vegetation are easily recognized and were simply colored in on the transparency. Such an overlay would probably be most useful for those test sites where the terrain geometry was not such a strong contributor to the backscatter signal as is true for MS6603.

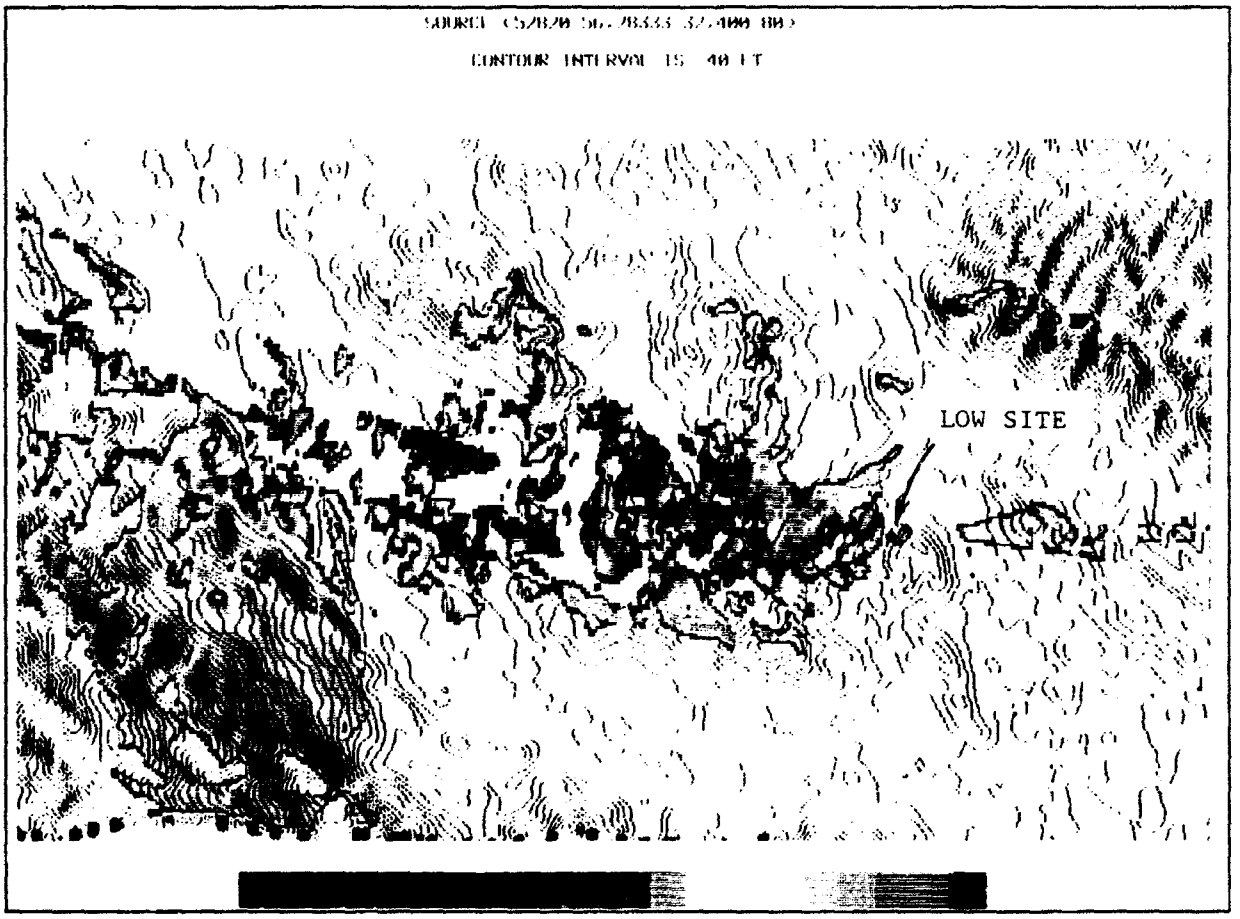
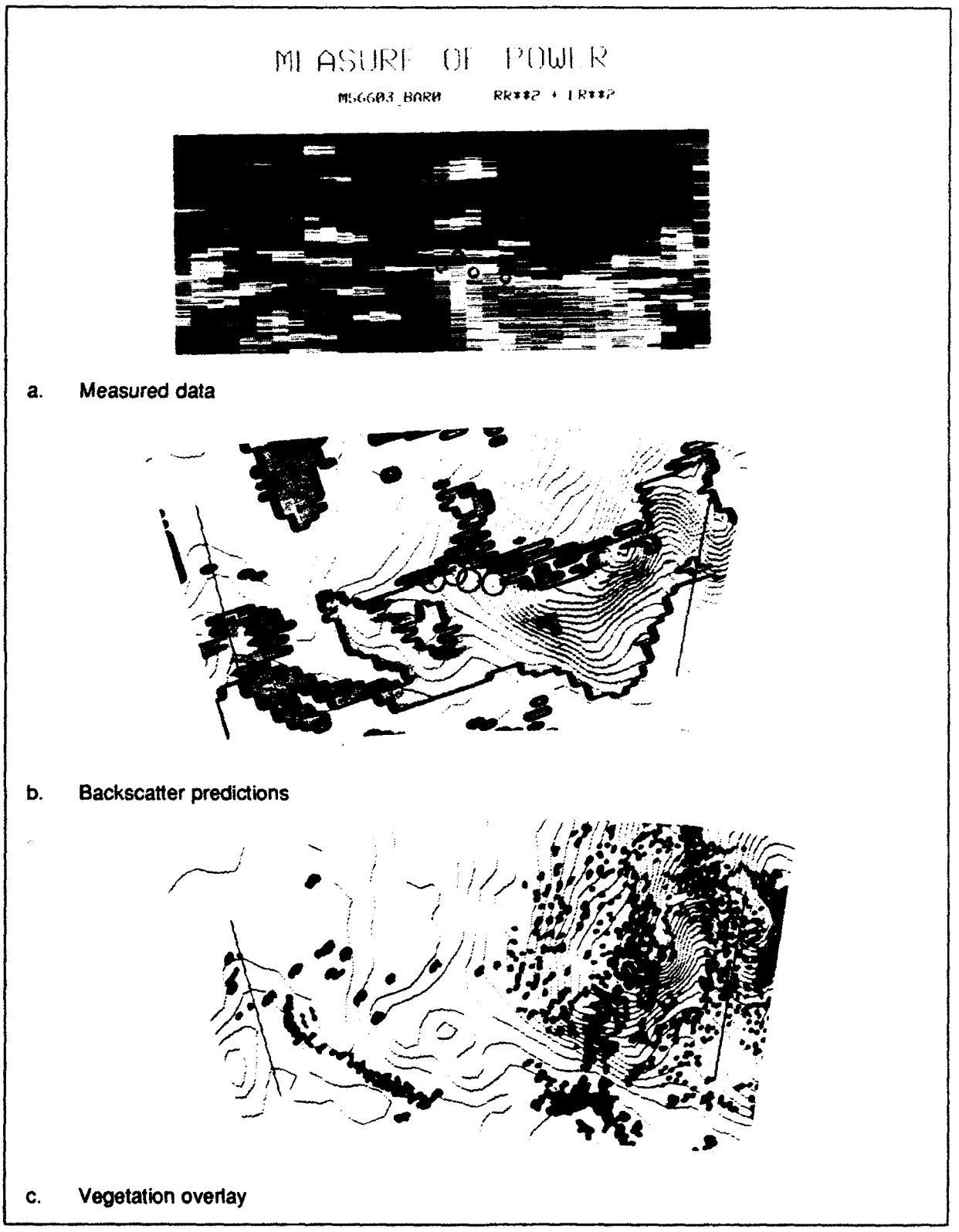


Figure 18. Backscatter model predictions for the low site location



a. Measured data

b. Backscatter predictions

c. Vegetation overlay

Figure 19. Backscatter prediction results and vegetation overlay for test MS6603

5 Summary and Recommendations

In an attempt to develop a scene characterization methodology for long-range (2 to 7 km), low-grazing angle (less than 10 deg) active millimeter wave radar systems, a twofold approach was taken. First, slant range versus azimuth maps of radar backscatter measurements were filtered using the target feature metric technique to collect statistics on the occurrence of target-like features and to relate those signatures to natural terrain conditions. Second, a prediction of radar returns from the terrain was modeled by a point light source at the radar location and the assumption of Lambertian scattering from the terrain facets. Model predictions were combined with overlays of vegetation at each test site and compared qualitatively with the measured data to assess the impact of terrain conditions on backscatter response.

Application of these analysis tools to the Martin Marietta radar data collected during the MSFD resulted in the following observations:

a. Man-made targets within the terrain backgrounds found at Fort Hunter Liggett are reasonably easy to locate in range-azimuth "images" when their positions are known, but might not be easily found by automated methods applied to either raw data or filtered data because of the strong target-like returns from the terrain at some test sites.

b. Not enough data on different types of target backgrounds are available from the MSFD trials to develop an effective statistical tool for quantifying background conditions for differing terrain conditions. The use of cumulative histograms for achieving this objective is still a potential tool, but more data from different backgrounds and collected with the same radar system is needed to pursue this train of thought.

c. A simple point light source model with assumed Lambertian scattering qualitatively correlates very well with observed data. Vegetation overlays serve to enhance that correlation. This implies that for the type of terrain offered by the Fort Hunter Liggett test sites, even crude surface geometry models and vegetation overlays will explain much of the background response.

d. Many questions about the impact of terrain on radar returns under the conditions stated above remain unanswered in part because of insufficient supporting data. Future tests in which radar data will be closely studied must include more comprehensive ground truth measurements. For example, had it been known prior to the execution of the MSFD that a detailed look at the radar data was going to be taken, a complete set of low-altitude, oblique, high-resolution color photography and video of all of the test sites could have been collected (from at least two of the

cardinal directions). This would have answered any questions about vegetation conditions or about the occurrence of man-made clutter and such natural features as rock outcroppings.

Having developed the data management and analysis tools for this study, it would be relatively easy to test other higher order target feature metrics. In fact, a database now exists for this one set of terrain conditions to take a closer look at existing target detection algorithms or to develop and test new ones. One very straightforward task that could be undertaken and that would require nothing more than to revisit these existing data would be to examine the impact of averaging multiple azimuth sweeps or comparing results from different elevation settings as suggested in Chapter 2.

In the area of modeling, it appears from the simple exercise conducted within this study that modifications of the point light source model could yield a valuable tool for predicting terrain signatures. Examples of such modifications would include more realistic scattering assumptions from grass-covered terrain and a coupling of tree and bush spatial information with a separate module for estimating an average backscatter from each species.

Appendix A
Scene Metric Statistics

The following pages contain a summary of common statistics for the log-scale histograms associated with each of the 24 MSFD radar scenes. There is a table for data that represent the total power returned to the radar receiver (BAND=total power) as well as a table for the power measured on the right receive-right transmit channel (BAND=polarization RR) and for power measured on the left receive-right transmit channel (BAND=polarization LR). Each of these tables has, in turn, separate sheets for each radar target feature metric (METRIC=measure of power, METRIC=signal to clutter, METRIC=variance). The final table summarizes results for the polarization ratio metric (BAND=LR/RR, METRIC=polarization ratio).

RADAR SCENE METRICS

statistics based on histograms of log metric values for target-free background

BAND=total power METRIC=measure of power

test ID	elevation setting	mean	standard deviation	skewness	kurtosis	minimum	5-percentile	25-percentile	median	mode	75-percentile	95-percentile	maximum
MS5502	0	-4.00	20.10	0.1166	-0.2174	-29.10	-13.10	-8.30	-4.30	-6.80	0.30	6.30	22.00
MS5503	0	-6.60	13.60	-0.0981	-1.0280	-30.00	-21.90	-15.30	-5.60	0.40	1.60	8.40	18.50
MS5504	0	-8.90	13.30	0.0105	-0.9670	-30.00	-20.50	-15.30	-9.10	-14.80	-2.30	3.20	20.80
MS5601	0	-3.00	19.70	-0.4626	-0.5383	-30.00	-15.60	-8.60	-1.50	0.90	2.70	7.10	16.60
MS5602	1	-5.30	18.50	0.2447	-0.1814	-30.00	-14.60	-9.60	-6.10	-7.80	-0.90	5.70	18.30
MS5603	0	-5.30	17.70	0.1061	-0.6600	-30.00	-15.60	-10.60	-6.10	-9.60	0.40	6.10	19.60
MS5604	1	-5.30	16.80	0.1198	-0.6949	-30.00	-17.30	-11.40	-5.80	-10.10	0.90	7.90	19.40
MS5702	1	-2.80	21.60	0.1563	0.0184	-30.00	-11.60	-6.60	-3.20	-4.80	1.10	7.30	22.90
MS5703	0	-3.00	21.10	-0.0628	-0.1584	-29.80	-12.40	-7.10	-3.00	-1.50	1.30	6.70	17.90
MS5704	0	-7.30	14.20	-0.0580	-1.0781	-30.00	-20.10	-14.60	-6.40	-15.90	0.30	5.80	14.80
MS5801	1	-8.40	13.80	0.3685	-0.2926	-30.00	-19.60	-14.10	-9.10	-13.10	-3.20	6.20	18.00
MS5802	1	-3.80	20.60	0.1842	0.0732	-30.00	-12.40	-7.60	-4.20	-5.30	0.10	6.20	22.80
MS5803	1	-13.30	7.00	0.6317	-0.5635	-30.00	-25.80	-20.50	-16.30	-30.00	-5.80	5.30	19.10
MS5804	1	-3.30	20.80	0.1757	-0.0809	-30.00	-12.30	-7.30	-3.80	-4.20	0.80	6.90	18.40
MS6001	1	-8.10	16.50	0.7916	1.7457	-30.00	-15.90	-11.30	-8.60	-8.40	-5.60	2.80	24.00
MS6002	0	-8.40	16.40	0.6645	1.4655	-30.00	-15.90	-11.40	-8.80	-9.40	-5.80	2.00	23.00
MS6004	0	-9.90	15.10	0.6760	1.8996	-30.00	-17.30	-12.90	-10.10	-9.10	-7.60	-0.60	15.90
MS6101	0	-8.90	16.20	0.5507	1.6237	-30.00	-16.30	-11.80	-9.10	-9.40	-6.30	0.30	23.60
MS6102	1	-9.30	15.40	0.7729	1.7452	-30.00	-17.00	-12.40	-9.80	-10.30	-6.80	1.50	20.40
MS63011	0	-8.60	13.30	0.0486	-0.7582	-30.00	-21.10	-15.10	-8.80	-15.80	-2.30	4.70	14.10
MS63012	0	-9.90	13.30	0.6631	0.2613	-30.00	-19.30	-14.40	-11.10	-13.10	-5.80	3.80	15.60
MS6403	0	-16.30	7.10	1.1072	1.5863	-30.00	-24.90	-20.30	-17.30	-18.00	-13.80	-2.00	13.90
MS6603	0	-7.10	14.20	0.4953	-0.4617	-30.00	-19.00	-13.60	-8.80	-13.30	-0.80	9.30	21.50
MS6701	0	-10.40	12.00	0.6072	-0.0890	-30.00	-20.60	-15.60	-11.90	-14.40	-5.30	4.40	21.60

RADAR SCENE METRICS

statistics based on histograms of log metric values for target-free background

BAND=total power METRIC=signal to clutter

test ID	elevation setting	mean	standard deviation	skewness	kurtosis	minimum	5-percentile	25-percentile	median	mode	75-percentile	95-percentile	maximum
MS5502	0	-0.60	27.20	-0.3859	3.4497	-15.30	-4.30	-1.60	-0.30	-0.30	0.90	2.80	19.30
MS5503	0	-0.40	27.50	-0.5031	3.2231	-17.00	-3.80	-1.50	-0.30	-0.40	0.90	3.00	10.90
MS5504	0	-0.30	27.70	0.0590	1.6498	-10.40	-3.30	-1.50	-0.30	-0.40	0.90	3.00	14.90
MS5601	0	-0.40	27.40	-0.4718	1.6200	-12.40	-4.00	-1.50	-0.30	-0.10	1.00	3.00	8.10
MS5602	1	-0.60	27.00	-0.5119	1.8943	-14.90	-4.80	-1.80	-0.30	-0.60	0.90	3.00	11.90
MS5603	0	-0.40	27.50	-0.2905	3.5459	-16.80	-3.80	-1.50	-0.30	-0.60	0.90	3.00	16.10
MS5604	1	-0.80	26.50	-0.4061	1.9134	-17.30	-5.30	-2.20	-0.60	-1.10	0.90	3.50	13.30
MS5702	1	-0.40	27.60	-0.1027	1.6041	-12.10	-3.80	-1.50	-0.30	-0.60	0.90	2.80	12.60
MS5703	0	-0.60	27.20	-0.1790	1.2625	-12.90	-4.30	-1.80	-0.30	-0.60	0.90	3.30	11.40
MS5704	0	-0.30	27.80	-0.3879	1.7609	-17.00	-3.30	-1.40	-0.30	-0.60	0.90	2.70	7.20
MS5801	1	-0.90	26.10	-0.5079	2.5398	-17.40	-6.20	-2.20	-0.60	-0.30	0.90	4.00	13.60
MS5802	1	-0.40	27.60	-0.2671	1.4327	-12.40	-3.70	-1.50	-0.30	-0.20	0.90	2.70	10.90
MS5803	1	-1.30	25.00	-0.1140	1.4213	-20.00	-7.40	-3.00	-1.10	-1.10	0.80	5.80	16.10
MS5804	1	-0.60	27.40	-0.1832	2.4962	-12.60	-3.80	-1.60	-0.30	-0.40	0.90	2.80	17.60
MS6001	1	-0.60	26.90	-0.4724	2.7858	-14.10	-5.20	-1.60	-0.30	-0.20	0.90	3.30	14.90
MS6002	0	-0.60	27.00	-0.7061	4.0231	-17.40	-4.70	-1.50	-0.30	0.10	0.90	3.00	14.60
MS6004	0	-0.40	27.30	-0.1393	2.5867	-14.10	-4.10	-1.50	-0.30	-0.80	0.90	3.30	12.90
MS6101	0	-0.40	27.30	-0.5255	5.3425	-18.90	-4.10	-1.50	-0.30	0.10	0.90	2.80	19.10
MS6102	1	-0.60	26.90	-0.5691	3.5286	-18.80	-5.30	-1.50	-0.30	0.20	0.90	3.00	13.10
MS63011	0	-0.90	26.10	-0.5994	2.7994	-17.10	-5.80	-2.30	-0.60	-0.60	0.90	3.70	17.40
MS63012	0	-0.90	25.90	-0.4176	2.3645	-17.50	-6.40	-2.30	-0.80	-0.80	0.90	4.00	17.80
MS6403	0	-0.80	26.50	0.6199	1.4850	-12.60	-4.60	-2.30	-1.00	-1.40	0.40	5.20	15.60
MS6603	0	-1.10	25.50	-0.6575	2.1034	-17.60	-7.40	-2.50	-0.60	-0.80	0.90	4.00	17.00
MS6701	0	-1.50	24.60	-0.2589	1.1668	-20.50	-8.40	-3.30	-1.30	-1.30	0.80	5.40	18.80

RADAR SCENE METRICS

statistics based on histograms of log metric values for target-free background

BAND=total power METRIC=variance

test ID	elevation setting	mean	standard deviation	skewness	kurtosis	minimum	5-percentile	25-percentile	median	mode	75-percentile	95-percentile	maximum
MS5502	0	-11.10	13.40	0.2301	-0.8627	-22.00	-18.80	-16.10	-10.90	-17.40	-6.70	-2.30	8.60
MS5503	0	-13.30	7.70	-0.1115	-1.2751	-30.00	-26.90	-22.40	-11.60	-23.90	-5.40	0.20	5.80
MS5504	0	-15.80	7.40	0.0401	-1.4210	-28.90	-25.10	-22.00	-14.90	-22.00	-9.10	-5.80	5.30
MS5601	0	-9.90	13.50	-0.7526	-0.7483	-25.00	-22.00	-14.80	-7.30	-5.80	-5.20	-2.30	3.80
MS5602	1	-12.30	12.30	0.4892	-0.8387	-22.50	-19.30	-16.90	-13.40	-16.50	-7.80	-2.50	5.80
MS5603	0	-12.40	11.20	0.2424	-1.2748	-24.00	-20.50	-18.50	-12.90	-18.80	-6.70	-2.50	7.10
MS5604	1	-11.60	11.50	0.1654	-1.0176	-26.40	-21.90	-17.50	-11.90	-18.90	-5.90	-0.60	7.20
MS5702	1	-9.90	15.20	0.4903	-0.5457	-20.00	-18.30	-14.10	-10.40	-14.80	-6.20	-1.30	8.40
MS5703	0	-9.90	15.20	-0.0206	-0.7626	-21.40	-18.00	-13.60	-9.60	-9.30	-6.10	-1.80	3.20
MS5704	0	-14.40	7.60	-0.1042	-1.5368	-29.10	-25.30	-22.90	-12.30	-23.40	-7.30	-3.30	1.30
MS5801	1	-14.40	8.70	0.5087	-0.5441	-29.00	-24.00	-19.50	-15.30	-18.80	-10.10	-1.10	5.70
MS5802	1	-11.10	14.00	0.5367	-0.4117	-20.40	-17.50	-15.30	-11.60	-16.30	-7.60	-2.50	8.60
MS5803	1	-17.90	3.40	0.5400	-0.8744	-30.00	-29.40	-24.10	-20.60	-30.00	-10.40	-2.00	4.30
MS5804	1	-10.60	14.30	0.3709	-0.8008	-21.00	-17.50	-15.10	-10.90	-16.30	-6.60	-1.80	6.20
MS6001	1	-14.90	10.00	1.8733	2.3573	-23.00	-19.60	-18.00	-16.50	-17.60	-13.60	-2.50	9.10
MS6002	0	-15.40	9.60	1.5682	1.9477	-24.40	-20.00	-18.50	-17.30	-17.80	-13.80	-4.30	8.10
MS6004	0	-16.90	9.10	1.8222	3.3802	-23.90	-20.90	-19.30	-17.90	-18.30	-15.90	-6.60	2.50
MS6101	0	-15.90	9.80	1.8383	3.6877	-23.00	-20.00	-18.50	-17.30	-18.80	-14.90	-6.20	8.60
MS6102	1	-16.50	8.20	1.6357	2.0067	-24.80	-21.30	-19.90	-18.50	-19.10	-15.10	-3.70	5.90
MS63011	0	-14.90	8.10	-0.0302	-1.0956	-30.00	-26.00	-21.00	-14.60	-5.80	-8.60	-4.10	1.40
MS63012	0	-15.60	8.10	0.8350	-0.2877	-27.10	-23.10	-20.30	-17.60	-18.50	-11.40	-3.00	3.20
MS6403	0	-21.40	2.80	1.1450	1.3386	-30.00	-28.60	-25.60	-21.80	-30.00	-19.50	-8.60	1.50
MS6603	0	-13.10	8.70	0.4436	-0.9693	-27.10	-23.40	-20.50	-14.60	-21.50	-6.60	1.60	8.60
MS6701	0	-14.90	8.20	0.5328	-0.4298	-30.00	-24.60	-19.40	-16.50	-16.90	-9.90	-2.00	8.10

RADAR SCENE METRICS

statistics based on histograms of log metric values for target-free background

BAND=polarization RR METRIC=measure of power

test ID	elevation setting	mean	standard deviation	skewness	kurtosis	minimum	5-percentile	25-percentile	median	mode	75-percentile	95-percentile	maximum
MS5502	0	-9.80	13.30	-0.2566	0.1307	-30.00	-21.80	-13.90	-9.40	-30.00	-4.80	1.50	21.90
MS5503	0	-11.90	7.70	-0.0208	-1.0232	-30.00	-29.50	-20.50	-11.40	-30.00	-3.30	4.30	15.30
MS5504	0	-14.60	7.10	0.0301	-0.8709	-30.00	-28.00	-20.80	-15.10	-30.00	-7.80	-1.50	10.90
MS5601	0	-8.80	13.10	-0.4509	-0.3761	-30.00	-23.10	-14.40	-7.80	-30.00	-2.70	2.50	13.10
MS5602	1	-10.90	12.10	-0.1757	0.0579	-30.00	-23.00	-15.10	-10.60	-30.00	-6.10	0.80	13.90
MS5603	0	-10.90	11.50	-0.1613	-0.3353	-30.00	-23.80	-15.90	-10.90	-30.00	-5.20	1.10	17.30
MS5604	1	-16.60	10.80	-0.0250	-0.5058	-30.00	-24.90	-16.50	-10.80	-30.00	-4.10	3.50	14.90
MS5702	1	-8.40	14.90	-0.3334	0.3711	-30.00	-20.10	-12.40	-7.90	-7.30	-3.80	2.50	13.40
MS5703	0	-9.10	14.30	-0.4331	0.2655	-30.00	-21.00	-13.10	-8.60	-30.00	-4.30	1.30	11.60
MS5704	0	-12.90	8.10	-0.0396	-0.9572	-30.00	-28.00	-19.90	-12.90	-30.00	-5.30	1.00	10.80
MS5801	1	-14.10	7.70	0.2237	-0.3555	-30.00	-28.00	-19.80	-14.40	-30.00	-8.30	0.90	12.40
MS5802	1	-9.10	14.10	-0.3061	0.3195	-30.00	-20.80	-13.10	-8.80	-8.60	-4.70	1.60	12.40
MS5803	1	-18.90	0.90	0.7863	-0.4776	-30.00	-29.90	-27.50	-22.00	-30.00	-11.40	1.00	14.10
MS5804	1	-8.60	14.40	-0.2744	0.2218	-30.00	-20.80	-12.90	-8.40	-9.40	-3.80	2.70	16.50
MS6001	1	-13.80	9.90	-0.0521	0.6047	-30.00	-25.00	-17.40	-13.40	-30.00	-9.90	-3.50	12.80
MS6002	0	-13.90	10.00	-0.1348	0.4747	-30.00	-25.00	-17.50	-13.40	-30.00	-9.90	-3.80	12.10
MS6004	0	-15.40	8.60	-0.1076	0.5739	-30.00	-26.30	-18.90	-14.90	-30.00	-11.60	-6.30	11.60
MS6101	0	-14.10	9.80	-0.2019	0.4734	-30.00	-25.10	-17.50	-13.60	-30.00	-10.10	-4.30	12.60
MS6102	1	-14.40	9.30	-0.0469	0.5254	-30.00	-25.50	-18.00	-14.10	-30.00	-10.60	-4.40	17.30
MS63011	0	-13.80	7.30	0.1142	-0.7805	-30.00	-29.00	-20.50	-13.90	-30.00	-6.80	1.50	12.30
MS63012	0	-15.40	7.10	0.3520	0.0529	-30.00	-27.90	-20.10	-15.60	-30.00	-10.90	-1.40	11.90
MS6403	0	-20.80	2.10	1.0721	1.3044	-30.00	-29.90	-25.90	-21.60	-30.00	-17.50	-6.10	10.90
MS6603	0	-12.40	8.20	0.4052	-0.3115	-30.00	-27.00	-19.00	-13.60	-30.00	-5.90	5.30	18.60
MS6701	0	-15.90	6.10	0.4345	-0.1454	-30.00	-29.10	-21.30	-16.50	-30.00	-10.90	-0.80	21.60

RADAR SCENE METRICS

statistics based on histograms of log metric values for target-free background

BAND=polarization RR METRIC=signal to clutter

test ID	elevation setting	mean	standard deviation	skewness	kurtosis	minimum	5-percentile	25-percentile	median	mode	75-percentile	95-percentile	maximum
MS5502	0	-0.60	27.10	-0.2437	2.5659	-16.50	-4.60	-2.00	-0.30	-0.60	1.00	3.30	19.50
MS5503	0	-0.60	27.10	-0.4862	1.8181	-17.60	-4.40	-1.90	-0.30	-0.40	1.10	3.20	10.90
MS5504	0	-0.40	27.50	-0.2092	0.8172	-11.90	-4.00	-1.60	-0.30	-0.60	1.10	3.00	11.40
MS5601	0	-0.60	27.10	-0.2666	0.7596	-12.40	-4.40	-1.90	-0.30	-0.60	1.10	3.30	9.60
MS5602	1	-0.60	26.90	-0.1577	0.7179	-14.90	-4.70	-2.20	-0.40	-0.60	1.00	3.50	12.60
MS5603	0	-0.60	27.10	-0.2478	1.9764	-16.40	-4.30	-1.90	-0.30	-0.30	1.10	3.20	16.40
MS5604	1	-0.90	26.30	-0.1297	0.7725	-16.00	-5.70	-2.50	-0.80	-0.30	1.00	4.00	13.30
MS5702	1	-0.60	27.30	-0.1618	0.8455	-10.80	-4.10	-1.90	-0.30	-0.30	1.00	3.00	14.40
MS5703	0	-0.60	27.10	-0.1240	0.5730	-13.80	-4.40	-2.00	-0.30	0.10	1.10	3.30	10.90
MS5704	0	-0.40	27.50	-0.3044	0.5627	-13.10	-4.00	-1.60	-0.30	0.20	1.00	3.00	7.30
MS5801	1	-0.90	26.20	-0.4131	2.0132	-16.00	-6.10	-2.30	-0.60	-0.80	1.10	3.70	14.10
MS5802	1	-0.60	27.30	-0.2524	0.3872	-11.60	-4.20	-1.80	-0.30	-0.20	1.00	3.00	7.20
MS5803	1	-1.10	25.40	-0.6851	2.3392	-21.00	-7.80	-2.80	-0.80	-0.90	0.90	3.80	15.80
MS5804	1	-0.60	27.20	-0.1753	0.8623	-11.40	-4.30	-1.90	-0.40	-0.30	1.00	3.20	15.80
MS6001	1	-0.60	27.00	-0.1583	0.7888	-13.80	-4.70	-2.00	-0.40	-0.90	1.10	3.70	10.10
MS6002	0	-0.60	27.10	-0.3262	1.4211	-13.60	-4.30	-1.80	-0.30	-0.60	1.00	3.20	11.10
MS6004	0	-0.40	27.40	-0.2581	0.7116	-11.80	-4.20	-1.80	-0.30	-0.30	1.00	3.00	9.60
MS6101	0	-0.40	27.30	-0.2201	0.9860	-14.60	-4.30	-1.90	-0.30	-0.60	1.10	3.20	13.60
MS6102	1	-0.60	27.10	-0.3083	1.2493	-13.90	-4.40	-1.90	-0.30	-0.60	1.10	3.20	11.30
MS63011	0	-1.00	25.80	-0.5433	2.0276	-20.60	-6.60	-2.80	-0.80	-0.40	1.00	3.80	15.80
MS63012	0	-0.90	26.10	-0.3712	1.7123	-20.30	-5.80	-2.50	-0.60	-0.20	1.00	3.80	15.60
MS6403	0	-0.90	26.30	0.1970	1.3886	-13.90	-5.30	-2.50	-0.90	-0.60	0.90	4.40	16.30
MS6603	0	-1.10	25.50	-0.3761	1.4862	-18.80	-6.80	-2.80	-0.90	-0.90	1.00	4.10	18.80
MS6701	0	-1.30	25.30	-0.3939	1.1033	-19.10	-7.60	-3.00	-0.90	-0.90	1.00	4.30	14.80

RADAR SCENE METRICS

statistics based on histograms of log metric values for target-free background

BAND=polarization RR METRIC=variance

test ID	elevation setting	mean	standard deviation	skewness	kurtosis	minimum	5-percentile	25-percentile	median	mode	75-percentile	95-percentile	maximum
MS5502	0	-13.80	11.60	0.4566	-0.3201	-24.50	-20.00	-17.60	-14.10	-18.40	-10.10	-5.70	8.90
MS5503	0	-15.90	4.80	-0.0981	-1.3500	-30.00	-29.50	-25.80	-14.10	-30.00	-8.10	-2.20	2.20
MS5504	0	-19.00	4.20	0.0742	-1.5459	-30.00	-27.80	-25.80	-18.30	-26.00	-12.40	-8.90	-3.80
MS5601	0	-12.90	11.20	-0.6564	-0.9120	-26.60	-23.40	-18.00	-10.40	-8.90	-8.30	-5.80	-0.30
MS5602	1	-14.60	11.10	0.6131	-0.4164	-24.10	-20.10	-17.90	-15.60	-17.10	-11.30	-6.20	1.90
MS5603	0	-14.90	9.60	0.2564	-1.2238	-25.80	-22.00	-19.90	-15.40	-20.00	-9.90	-6.40	4.30
MS5604	1	-13.90	9.70	0.2097	-0.9225	-28.00	-23.40	-19.00	-14.60	-19.00	-8.60	-3.20	3.20
MS5702	1	-12.40	13.50	0.6185	-0.3426	-21.80	-17.80	-15.60	-13.30	-16.50	-9.40	-4.80	0.90
MS5703	0	-12.90	13.10	0.1053	-0.6106	-23.00	-19.40	-15.90	-12.90	-11.90	-9.90	-6.10	-0.60
MS5704	0	-17.30	5.20	-0.0651	-1.5596	-30.00	-27.50	-25.30	-15.10	-26.30	-10.40	-6.60	-2.30
MS5801	1	-17.60	5.70	0.5200	-0.6425	-30.00	-26.50	-23.10	-18.50	-22.30	-13.10	-4.80	0.60
MS5802	1	-13.30	12.60	0.6356	-0.2485	-22.90	-18.50	-16.50	-13.90	-16.50	-10.30	-5.60	0.20
MS5803	1	-22.00	-1.40	0.7567	-0.9444	-30.00	-29.90	-29.90	-27.90	-30.00	-13.60	-4.30	1.30
MS5804	1	-12.60	13.00	0.5403	-0.4741	-22.00	-18.50	-16.30	-13.40	-16.40	-9.40	-4.70	3.30
MS6001	1	-17.40	9.00	1.8606	4.0711	-25.00	-21.30	-19.50	-18.30	-18.80	-16.50	-9.30	0.90
MS6002	0	-18.00	8.40	1.6371	2.5550	-25.00	-21.80	-20.10	-19.00	-19.50	-17.00	-9.40	0.10
MS6004	0	-19.60	7.20	2.1562	5.8709	-26.00	-22.90	-21.50	-20.40	-20.60	-19.00	-12.40	-1.00
MS6101	0	-17.90	8.80	1.7278	3.4631	-25.00	-21.50	-19.90	-18.60	-19.40	-17.00	-10.40	-0.40
MS6102	1	-18.50	7.70	1.8688	3.9133	-26.60	-22.30	-20.80	-19.50	-20.00	-17.60	-9.40	2.70
MS63011	0	-17.00	5.40	0.0650	-1.2061	-30.00	-28.30	-24.00	-17.30	-30.00	-9.90	-5.30	-0.30
MS63012	0	-18.90	5.40	1.0133	0.0798	-29.50	-25.00	-23.00	-21.00	-23.00	-15.10	-6.40	0.20
MS6403	0	-24.00	0.20	1.6740	2.4958	-30.00	-29.90	-27.80	-25.50	-30.00	-22.60	-10.60	-0.60
MS6603	0	-15.60	6.40	0.6148	-0.6272	-29.60	-25.30	-22.50	-17.30	-23.10	-9.60	-0.20	6.70
MS6701	0	-19.00	4.40	0.7469	-0.3757	-30.00	-26.80	-24.40	-20.80	-24.50	-14.10	-6.70	6.10

RADAR SCENE METRICS

statistics based on histograms of log metric values for target-free background

BAND=polarization LR METRIC=measure of power

test ID	elevation setting	mean	standard deviation	skewness	kurtosis	minimum	5-percentile	25-percentile	median	mode	75-percentile	95-percentile	maximum
MS5502	0	-7.20	15.30	-0.2425	0.0124	-30.00	-19.80	-11.90	-6.90	-9.60	-1.60	4.90	18.00
MS5503	0	-9.60	10.10	-0.0908	-0.9269	-30.00	-27.00	-18.00	-8.90	-30.00	-0.90	6.60	18.10
MS5504	0	-11.90	9.50	-0.0643	-0.8066	-30.00	-26.40	-18.10	-12.10	-30.00	-4.60	1.90	20.30
MS5601	0	-6.10	15.50	-0.4903	-0.3644	-30.00	-21.10	-12.10	-4.60	-30.00	0.80	5.90	16.50
MS5602	1	-8.60	13.60	-0.0812	-0.0748	-30.00	-21.50	-13.60	-8.80	-30.00	-3.30	4.30	18.30
MS5603	0	-8.60	13.20	-0.0885	-0.4366	-30.00	-22.10	-14.30	-8.90	-30.00	-2.00	4.80	19.50
MS5604	1	-8.60	12.40	-0.0127	-0.5240	-30.00	-23.30	-15.10	-8.90	-30.00	-1.80	6.30	18.00
MS5702	1	-5.90	16.80	-0.2570	0.2730	-30.00	-18.30	-10.40	-5.80	-7.20	-0.90	5.80	22.80
MS5703	0	-6.10	16.50	-0.3631	0.1322	-30.00	-18.90	-10.60	-5.70	-5.80	-0.60	5.60	17.50
MS5704	0	-10.10	10.30	-0.1029	-0.9076	-30.00	-26.00	-17.50	-9.90	-30.00	-2.00	4.30	14.30
MS5801	1	-11.40	9.80	0.1998	-0.2920	-30.00	-25.60	-17.40	-11.90	-30.00	-5.40	4.30	17.90
MS5802	1	-7.20	15.70	-0.2455	0.2480	-30.00	-19.40	-11.60	-6.90	-5.20	-2.20	4.60	22.80
MS5803	1	-15.90	4.20	0.6141	-0.4438	-30.00	-29.90	-23.00	-18.00	-30.00	-8.80	2.80	18.90
MS5804	1	-6.80	15.90	-0.2344	0.1871	-30.00	-19.30	-11.30	-6.60	-7.60	-1.60	5.30	17.60
MS6001	1	-11.30	11.70	0.2027	0.9010	-30.00	-23.00	-15.30	-11.10	-30.00	-7.30	1.50	23.90
MS6002	0	-11.60	11.60	0.1160	0.7435	-30.00	-23.10	-15.60	-11.40	-30.00	-7.70	0.60	23.00
MS6004	0	-13.30	10.20	0.0971	0.7749	-30.00	-24.50	-17.00	-12.90	-30.00	-9.40	-2.00	15.60
MS6101	0	-12.40	11.10	0.0095	0.7998	-30.00	-23.60	-16.00	-12.10	-30.00	-8.40	-1.50	23.60
MS6102	1	-12.90	10.20	0.2643	0.8088	-30.00	-24.50	-16.90	-12.80	-30.00	-9.10	-0.20	20.30
MS63011	0	-12.10	9.20	-0.0230	-0.6656	-30.00	-27.00	-18.50	-12.10	-30.00	-5.30	2.20	13.10
MS63012	0	-13.10	8.90	0.3505	0.0471	-30.00	-26.00	-18.10	-13.60	-30.00	-8.30	2.00	15.30
MS6403	0	-19.50	3.40	0.8406	0.7775	-30.00	-29.90	-24.30	-20.00	-30.00	-15.90	-4.90	12.30
MS6603	0	-10.40	10.00	0.2914	-0.4405	-30.00	-25.00	-17.00	-11.60	-30.00	-3.70	6.80	20.10
MS6701	0	-13.40	7.90	0.3925	-0.2136	-30.00	-27.30	-19.30	-14.40	-30.00	-7.90	2.70	21.00

RADAR SCENE METRICS

statistics based on histograms of log metric values for target-free background

BAND=polarization LR METRIC=signal to clutter

test ID	elevation setting	mean	standard deviation	skewness	kurtosis	minimum	5-percentile	25-percentile	median	mode	75-percentile	95-percentile	maximum
MS5502	0	-0.80	26.60	-0.4468	2.2395	-19.30	-5.30	-2.20	-0.40	-0.30	1.00	3.30	19.60
MS5503	0	-0.60	27.00	-0.4159	1.9472	-17.80	-4.70	-2.00	-0.40	-0.20	1.10	3.50	12.30
MS5504	0	-0.60	27.10	0.0033	0.9647	-12.30	-4.30	-2.00	-0.40	-0.30	1.10	3.70	15.90
MS5601	0	-0.60	27.00	-0.4957	1.2715	-14.80	-4.80	-2.00	-0.30	-0.40	1.10	3.30	8.90
MS5602	1	-0.90	26.30	-0.5733	1.6214	-17.80	-5.80	-2.30	-0.40	-0.30	1.00	3.50	11.90
MS5603	0	-0.60	27.00	-0.2482	2.0497	-17.60	-4.80	-2.00	-0.30	0.10	1.10	3.30	16.10
MS5604	1	-0.90	26.00	-0.5243	1.8309	-18.00	-6.30	-2.50	-0.60	-1.10	1.00	3.70	13.90
MS5702	1	-0.60	26.90	-0.2070	1.0420	-16.90	-4.80	-2.00	-0.40	-0.60	1.00	3.30	12.40
MS5703	0	-0.80	26.50	-0.2581	0.8866	-14.40	-5.30	-2.30	-0.60	-0.40	1.10	3.70	11.40
MS5704	0	-0.60	27.20	-0.3601	1.2238	-18.50	-4.30	-1.90	-0.30	-0.20	1.00	3.20	7.90
MS5801	1	-0.90	25.60	-0.5099	2.0642	-19.50	-6.80	-2.70	-0.80	-0.90	1.10	4.40	13.90
MS5802	1	-0.60	27.00	-0.3492	1.1534	-14.40	-4.80	-2.00	-0.40	-0.60	1.00	3.20	12.90
MS5803	1	-1.50	24.40	0.0212	0.9923	-23.10	-8.30	-3.70	-1.50	-1.60	0.90	6.70	16.80
MS5804	1	-0.60	26.80	-0.2577	1.6945	-15.30	-4.90	-2.20	-0.40	-0.20	1.00	3.30	18.50
MS6001	1	-0.80	26.20	-0.5223	2.1656	-15.90	-6.20	-2.20	-0.40	-0.30	1.00	3.70	17.00
MS6002	0	-0.80	26.30	-0.6613	2.7664	-20.00	-5.80	-2.00	-0.30	-0.20	1.10	3.50	15.90
MS6004	0	-0.80	26.50	-0.1624	1.6784	-17.40	-5.30	-2.20	-0.60	-0.40	1.00	4.00	13.90
MS6101	0	-0.60	26.60	-0.5916	3.9166	-22.90	-5.20	-2.00	-0.30	-0.20	1.10	3.30	20.60
MS6102	1	-0.90	26.10	-0.5857	2.6314	-21.40	-6.40	-2.20	-0.40	0.10	1.00	3.50	14.60
MS63011	0	-1.00	25.70	0.5125	2.1366	-17.40	-6.30	-2.70	-0.80	-0.30	1.00	4.10	18.90
MS63012	0	-1.10	25.30	-0.4033	1.8704	-21.00	-7.30	-3.00	-0.90	-1.80	1.00	4.40	19.40
MS6403	0	-0.90	25.90	0.5481	0.9421	-15.10	-5.40	-2.80	-1.10	-1.30	0.60	5.60	16.10
MS6603	0	-1.40	24.90	-0.6934	1.8123	-21.10	-8.40	-3.00	-0.80	-0.30	1.10	4.30	16.00
MS6701	0	-1.80	23.80	-0.2024	0.9951	-24.30	-9.60	-4.20	-1.60	-2.00	0.90	6.20	20.90

RADAR SCENE METRICS

statistics based on histograms of log metric values for target-free background

BAND=polarization LR METRIC=variance

test ID	elevation setting	mean	standard deviation	skewness	kurtosis	minimum	5-percentile	25-percentile	median	mode	75-percentile	95-percentile	maximum
MS5502	0	-10.90	13.70	0.1746	-1.0012	-23.50	-18.50	-15.90	-10.80	-17.00	-6.60	-2.30	6.20
MS5503	0	-13.40	7.80	-0.0736	-1.2880	-30.00	-26.50	-22.40	-11.90	-24.50	-5.70	-0.20	6.30
MS5504	0	-15.40	7.80	0.0443	-1.4260	-28.90	-24.80	-21.80	-14.80	-7.70	-8.90	-5.80	4.90
MS5601	0	-9.80	13.60	-0.7541	-0.7505	-25.90	-22.00	-14.60	-7.10	-5.40	-4.90	-2.20	3.80
MS5602	1	-12.60	11.70	0.4657	-0.8880	-24.60	-19.50	-17.60	-13.40	-18.00	-7.80	-2.50	6.90
MS5603	0	-12.40	11.20	0.2344	-1.3215	-24.00	-20.50	-16.50	-12.60	-18.50	-6.30	-2.20	5.70
MS5604	1	-12.10	10.70	0.1839	-1.1170	-26.60	-22.10	-18.90	-12.40	-20.00	-6.10	-0.60	6.30
MS5702	1	-9.90	15.30	0.4795	-0.5536	-19.90	-16.30	-14.10	-10.30	-14.10	-6.10	-1.00	8.60
MS5703	0	-9.60	15.40	-0.0423	-0.7647	-21.90	-17.90	-13.60	-9.40	-8.90	-5.80	-1.50	3.30
MS5704	0	-14.10	8.00	-0.0904	-1.5287	-29.00	-25.00	-22.50	-12.10	-23.90	-7.20	-3.20	1.80
MS5801	1	-14.40	8.60	0.5828	-0.4939	-28.40	-23.90	-19.90	-15.40	-20.30	-10.10	-0.90	5.30
MS5802	1	-11.10	14.00	0.5206	-0.3824	-20.80	-17.50	-15.30	-11.60	-16.50	-7.70	-2.30	8.60
MS5803	1	-18.00	3.70	0.5941	-0.7200	-30.00	-28.60	-23.80	-20.50	-30.00	-11.30	-2.30	5.10
MS5804	1	-10.60	14.30	0.3873	-0.7236	-20.60	-17.50	-15.10	-11.10	-15.40	-6.80	-1.50	5.30
MS6001	1	-14.90	9.90	1.6783	2.2778	-23.80	-19.50	-18.00	-16.80	-17.80	-13.40	-2.50	9.10
MS6002	0	-15.30	9.80	1.5897	2.0391	-23.50	-19.90	-18.40	-17.00	-18.10	-13.60	-4.00	8.40
MS6004	0	-16.50	9.30	1.8219	3.3553	-24.50	-20.60	-19.00	-17.60	-17.50	-15.60	-6.30	2.70
MS6101	0	-16.10	9.50	1.8701	3.7229	-23.50	-20.10	-18.60	-17.50	-18.60	-14.90	-6.30	8.80
MS6102	1	-16.50	8.10	1.6206	1.9151	-25.00	-21.40	-19.90	-18.50	-19.50	-15.10	-3.50	5.80
MS63011	0	-15.30	8.00	-0.0198	-1.0765	-30.00	-25.90	-21.30	-14.90	-9.90	-9.40	-4.80	0.90
MS63012	0	-15.80	8.10	0.8974	-0.1862	-27.00	-22.90	-20.30	-17.80	-18.80	-11.90	-3.30	2.80
MS6403	0	-22.00	2.50	1.2431	1.4911	-30.00	-28.60	-25.80	-22.80	-30.00	-20.40	-9.90	0.30
MS6603	0	-13.60	8.40	0.4562	-1.0062	-26.60	-23.40	-20.90	-14.90	-22.50	-6.80	0.90	7.70
MS6701	0	-15.10	8.20	0.6066	-0.3418	-28.60	-24.40	-19.40	-16.60	-18.40	-10.40	-2.30	8.10

RADAR SCENE METRICS

statistics based on histograms of log metric values for target-free background

BAND=LR/RR METRIC=polarization ratio

test ID	elevation setting	mean	standard deviation	skewness	kurtosis	minimum	5-percentile	25-percentile	median	mode	75-percentile	95-percentile	maximum
MS5502	0	2.70	30.10	-0.0784	0.3719	-10.60	-1.60	1.00	2.80	2.80	4.40	7.10	14.10
MS5503	0	2.50	30.00	0.0461	0.0780	-10.30	-1.50	0.90	2.50	3.00	4.30	6.80	13.60
MS5504	0	3.00	30.60	0.0518	0.2036	-7.20	-0.90	1.50	3.20	2.80	4.80	7.30	14.90
MS5601	0	3.00	30.40	0.0160	0.1897	-9.40	-1.30	1.40	3.00	3.30	4.80	7.30	15.60
MS5602	1	2.20	29.30	0.1473	0.1409	-9.60	-2.50	0.30	2.20	2.00	4.20	7.20	16.40
MS5603	0	2.50	29.70	0.0608	0.2025	-10.40	-2.00	0.60	2.50	2.50	4.30	7.10	14.60
MS5604	1	2.00	29.30	0.1766	0.2191	-7.90	-2.30	0.20	2.00	1.40	3.80	6.40	13.80
MS5702	1	2.50	29.90	0.0275	0.2202	-7.40	-1.80	0.90	2.50	2.50	4.30	6.80	17.50
MS5703	0	3.00	30.30	0.1168	0.1458	-9.60	-1.40	1.30	3.20	3.00	5.10	7.90	14.60
MS5704	0	2.80	30.40	0.0715	0.1708	-7.30	-1.10	1.30	3.00	3.30	4.60	7.10	15.90
MS5801	1	2.80	30.20	0.1787	0.3099	-9.60	-1.30	1.10	2.80	2.80	4.60	7.30	15.40
MS5802	1	2.00	29.50	0.0983	0.4198	-7.80	-2.00	0.40	2.20	1.50	3.80	6.30	19.50
MS5803	1	3.80	30.20	0.4668	0.8686	-9.10	-1.80	1.50	3.70	3.30	6.20	10.60	28.00
MS5804	1	2.00	29.40	0.0602	0.3054	-10.40	-2.20	0.30	2.00	2.50	3.80	6.30	13.30
MS6001	1	2.50	29.60	0.3370	0.3955	-8.10	-2.00	0.60	2.50	1.40	4.30	7.80	18.00
MS6002	0	2.30	29.50	0.2812	0.4047	-9.10	-2.00	0.60	2.30	2.70	4.30	7.40	15.80
MS6004	0	2.30	29.60	0.1467	0.1683	-9.40	-2.00	0.60	2.50	2.80	4.30	7.20	18.00
MS6101	0	1.60	28.90	0.2597	0.5827	-13.40	-2.70	-0.10	1.60	0.90	3.50	6.60	18.80
MS6102	1	1.60	28.70	0.4033	0.5731	-9.10	-2.80	-0.30	1.50	1.00	3.50	6.80	17.40
MS63011	0	1.80	29.10	0.0847	0.2225	-9.90	-2.70	-0.10	1.90	1.60	3.70	6.30	18.00
MS63012	0	2.50	29.70	0.2562	0.3087	-10.40	-1.90	0.60	2.50	2.00	4.30	7.30	14.80
MS6403	0	1.50	29.00	0.1595	0.7088	-10.90	-2.50	-0.10	1.60	0.90	3.30	5.90	21.00
MS6603	0	2.00	29.20	0.1939	0.2220	-8.90	-2.30	0.20	2.00	2.00	3.80	6.80	15.40
MS6701	0	2.70	29.70	0.1681	0.2815	-15.40	-1.90	0.80	2.70	1.80	4.70	7.80	20.40

Appendix B
Target Metric Statistics

In an attempt to make this document as useful as possible, statistics on radar feature metrics as they relate to the actual targets were compiled and are included in this appendix. The procedure for compiling these statistics was the following. First of all, a mask was created for each scene that served two purposes. One was to remove the influence of a man-made target on the radar return by effectively removing from the scene a portion of one or more azimuth slices that was centered on the likely location of each target. The other purpose was to identify the strongest return from that segment as the target return, or metric value. The target metric value was then compared with the target-free background to produce the global target prominence for that target that is defined in Chapter 3 of the main text.

As with the previous appendix, data are presented in terms of both the type of received signal considered (total power, right receive-right transmit (RR) polarization power, left receive-right transmit (LR) polarization power) and the metric being considered (measure of power, signal-to-clutter, variance, and polarization ratio).

TARGET RADAR METRICS

global target prominence measured relative to target-free background

BAND=total power METRIC=measure of power

target	orientation	comment	log metric value	global target prominence	range (meters)	UTM northing (meters)	UTM easting (meters)	test ID	elevation setting
M113	FRONT	IN OPEN	18.69990	0.99993	4204.000	75842.540	60686.090	MS5502	0
M60	REAR	IN OPEN	21.29170	0.99998	4298.000	75544.870	60691.750	MS5502	0
M60	RIGHT FRONT	IN OPEN	10.18710	0.99193	4166.000	75641.670	60568.220	MS5502	0
M35	LEFT FRONT	IN OPEN	28.66950	1.00000	4120.000	75653.160	60451.570	MS5502	0
ZSU	FRONT	SHADED	25.61810	1.00000	1703.000	78488.700	57970.690	MS5503	0
M35	FRONT	SHADED	14.26090	0.99813	1782.000	78474.130	57878.950	MS5503	0
M60	MOVER		18.58060	1.00000	1738.000	.	.	MS5503	0
M60	REAR	SHADED	17.12870	0.99997	2335.242	77301.210	58649.070	MS5504	0
UH1	RIGHT SIDE	IN OPEN	26.23990	1.00000	2419.179	77218.320	58836.180	MS5504	0
DECOY	FRONT	IN OPEN	18.49240	1.00000	3170.000	77894.780	56585.940	MS5601	0
M35	RIGHT SIDE	IN OPEN	10.06230	0.99169	3015.000	78003.990	56700.860	MS5601	0
M113	RIGHT FRONT	IN OPEN	12.63630	0.99852	3791.000	75865.740	59926.980	MS5602	1
UH1	FRONT	IN OPEN	13.02690	0.99889	3950.000	75702.860	59919.850	MS5602	1
M60	LEFT SIDE	IN OPEN	18.64590	0.99985	4080.000	75576.280	59950.970	MS5602	1
M35	REAR	IN OPEN	21.59930	1.00000	3511.000	77928.700	56170.000	MS5603	0
M35	FRONT	BEHIND TREE	18.68010	0.99998	3550.000	77890.260	56146.420	MS5603	0
ZSU	LEFT SIDE	IN OPEN	20.24950	1.00000	3660.000	77877.480	56029.000	MS5603	0
M60	RIGHT SIDE	IN OPEN	17.81140	0.99989	3041.000	76566.390	59496.020	MS5604	1
M60	RIGHT SIDE	IN OPEN	12.05310	0.99321	3065.000	76538.660	59440.020	MS5604	1
AH1	LEFT REAR	IN OPEN	8.46050	0.92330	2925.000	76676.870	59414.960	MS5604	1
M35	FRONT	SHADED	18.91180	0.99986	3214.000	76387.810	59421.170	MS5604	1
M113	RIGHT SIDE	IN OPEN	17.77340	0.99989	3112.000	76488.520	59382.500	MS5604	1
M113	LEFT SIDE	BEHIND TREES	13.03000	0.99627	3163.000	76435.380	59334.490	MS5604	1
M60	LEFT REAR		18.15040	0.99991	4456.000	.	.	MS5702	1
M113	RIGHT FRONT		14.47950	0.99887	4570.000	.	.	MS5702	1
M60	LEFT FRONT		18.15040	0.99991	4456.000	.	.	MS5702	1
M35	RIGHT FRONT		15.60680	0.99963	4574.000	.	.	MS5702	1
M60	LEFT FRONT		13.16530	0.99906	3880.000	.	.	MS5703	0
M35	FRONT		22.07110	1.00000	3919.000	.	.	MS5703	0
DECOY	N/A		14.90070	0.99985	3809.000	.	.	MS5703	0
M60	RIGHT FRONT		17.59900	0.99996	3909.000	.	.	MS5703	0
M113	RIGHT FRONT		12.75560	0.99862	3991.000	.	.	MS5703	0
M60	RIGHT FRONT		4.94020	0.93263	2469.000	.	.	MS5704	0
M113	RIGHT FRONT		25.73140	1.00000	2349.000	.	.	MS5704	0
M35	LEFT FRONT		17.08500	1.00000	2213.000	.	.	MS5704	0
M35	RIGHT FRONT		19.22620	1.00000	2657.000	.	.	MS5801	1
M60	LEFT FRONT		13.89270	0.99867	2644.000	.	.	MS5801	1
M113	FRONT		8.10760	0.97313	2612.000	.	.	MS5801	1
M35	RIGHT FRONT		16.16180	0.99969	4596.000	.	.	MS5802	1
M113	RIGHT FRONT		17.00940	0.99989	4565.000	.	.	MS5802	1
DECOY	FRONT		15.27160	0.99972	4456.000	.	.	MS5802	1
M60	RIGHT FRONT		9.34920	0.98675	4574.000	.	.	MS5802	1

TARGET RADAR METRICS

global target prominence measured relative to target-free background

BAND=total power METRIC=measure of power (continued)

target	orientation	comment	log metric value	global target prominence	range (meters)	UTM northing (meters)	UTM easting (meters)	test ID	elevation setting
ZSU	REAR		27.98550	1.00000	1481.000	.	.	MS5803	1
M60	REAR		8.48550	0.98271	1352.000	.	.	MS5803	1
M113	FRONT		11.28410	0.99525	1484.000	.	.	MS5803	1
M60	LEFT SIDE		22.27620	1.00000	1376.000	.	.	MS5803	1
M113	FRONT		24.80390	1.00000	4570.000	.	.	MS5804	1
M60	RIGHT SIDE		18.16590	0.99998	4456.000	.	.	MS5804	1
M113	LEFT SIDE	UNDER TREES	18.42870	0.99991	3878.000	79437.000	54153.000	MS6001	1
M35	LEFT FRONT	UNDER TREES	20.72510	0.99996	3898.000	79490.000	54147.000	MS6001	1
M35	LEFT FRONT	UNDER TREES	18.61560	0.99993	3919.000	79570.000	54151.000	MS6001	1
AH1	LEFT SIDE	BEHIND TREETOP	-0.73120	0.91384	4184.000	79273.000	53793.000	MS6002	0
M113	UNKNOWN	BEHIND TREETOP	5.37360	0.97594	4138.000	79292.000	53845.000	MS6002	0
M113	UNKNOWN	BEHIND TREETOP	0.42690	0.93038	4170.000	79319.000	53818.000	MS6002	0
M35	RIGHT SIDE	IN OPEN	18.24710	0.99998	3845.000	79466.000	54196.000	MS6002	0
M35	RIGHT SIDE	BEHIND TREETOP	15.53420	0.99983	3852.000	79495.000	54197.000	MS6002	0
M60	LEFT SIDE	IN OPEN	16.89940	1.00000	3843.000	79424.000	54185.000	MS6004	0
M113	RIGHT FRONT	IN OPEN	22.13600	1.00000	3878.000	79437.000	54153.000	MS6004	0
M113	LEFT FRONT	UNDER TREES	11.94770	0.99942	3898.000	79490.000	54147.000	MS6004	0
M35	RIGHT SIDE	IN OPEN	21.86530	1.00000	3919.000	79570.000	54151.000	MS6004	0
M35	FRONT	BEHIND TREETOP	21.17960	0.99996	4184.000	.	.	MS6101	0
M35	RIGHT SIDE	BEHIND TREES	8.54520	0.99534	4169.000	79397.000	53839.000	MS6101	0
M60	LEFT SIDE	IN OPEN	17.46540	0.99993	3843.000	79424.000	54185.000	MS6101	0
ZSU	LEFT FRONT	NEAR TREE	13.36120	0.99970	3898.000	79490.000	54147.000	MS6101	0
M60	RIGHT SIDE		14.68010	0.99991	3919.000	.	.	MS6101	0
M113	LEFT FRONT	BEHIND TREETOP	10.18390	0.99630	4142.000	79372.000	53860.000	MS6102	1
M113	FRONT	IN TREES	24.15280	1.00000	3898.000	79490.000	54147.000	MS6102	1
ZSU	LEFT SIDE		20.33490	0.99998	3919.000	.	.	MS6102	1
M60	LEFT FRONT		18.87590	1.00000	1969.000	.	.	MS63011	0
M60	RIGHT FRONT	IN OPEN	16.54490	1.00000	1963.000	78576.000	55922.000	MS63011	0
M60	LEFT FRONT	IN OPEN	21.77830	1.00000	1922.000	78598.000	55966.000	MS63011	0
M60	LEFT FRONT	IN OPEN	23.47820	1.00000	1985.000	78620.000	55906.000	MS63011	0
ZSU	FRONT	IN OPEN	18.93070	1.00000	3130.000	79143.000	54847.000	MS63012	0
M113	RIGHT SIDE	FRONT OF TREES	15.46010	0.99998	3090.000	79173.000	54896.000	MS63012	0
UH1	REAR	IN OPEN	13.46600	0.99854	3045.000	79175.000	54944.000	MS63012	0
M113	LEFT SIDE	IN OPEN	19.67030	1.00000	3078.000	79208.000	54919.000	MS63012	0
M60	LEFT SIDE	TOP SHOWING	31.17480	1.00000	1656.000	79038.000	56371.000	MS6403	0
M60	RIGHT SIDE	TOP SHOWING	22.26800	1.00000	1590.000	79025.000	56436.000	MS6403	0
ZSU	LEFT FRONT	TOP SHOWING	14.80770	1.00000	1510.000	78999.000	56514.000	MS6403	0
M113	RIGHT FRONT	TOP SHOWING	7.99970	0.99742	1546.000	79070.000	56398.000	MS6403	0
UH1	RIGHT REAR	IN OPEN	10.92790	0.99956	1483.000	79013.000	56553.000	MS6403	0
M60	RIGHT FRONT	IN OPEN	20.48010	0.99993	2510.810	79085.000	55475.000	MS6603	0
ZSU	REAR	IN OPEN	22.49280	1.00000	2535.700	79127.000	55462.000	MS6603	0

TARGET RADAR METRICS

global target prominence measured relative to target-free background

BAND=total power METRIC=measure of power
(continued)

target	orientation	comment	log metric value	global target prominence	range (meters)	UTM northing (meters)	UTM easting (meters)	test ID	elevation setting
M60	LEFT FRONT	WITH BRUSH	9.64760	0.95532	2494.040	79165.000	55519.000	MS6603	0
M113	LEFT FRONT	IN OPEN	12.42290	0.98124	2490.270	79192.000	55533.000	MS6603	0
M113	RIGHT FRONT	IN OPEN	23.27680	1.00000	2333.730	78471.000	55541.000	MS6701	0
ZSU	REAR	IN OPEN	18.31570	0.99891	2380.870	78504.000	55496.000	MS6701	0
M35	LEFT SIDE	PART BEHIND HILL	7.50200	0.98149	2414.820	78558.000	55466.000	MS6701	0

TARGET RADAR METRICS

global target prominence measured relative to target-free background

BAND=total power METRIC=signal to clutter

target	orientation	comment	log metric value	global target prominence	range (meters)	UTM northing (meters)	UTM easting (meters)	test ID	elevation setting
M113	FRONT	IN OPEN	10.21580	0.99940	4204.000	75642.540	60686.090	MS5502	0
M60	REAR	IN OPEN	1.73550	0.87578	4298.000	75544.870	60691.750	MS5502	0
M60	RIGHT FRONT	IN OPEN	13.71040	0.99977	4166.000	75641.670	60568.220	MS5502	0
M35	LEFT FRONT	IN OPEN	21.52520	1.00000	4120.000	75653.160	60451.570	MS5502	0
ZSU	FRONT	SHADED	15.80930	1.00000	1703.000	78488.700	57970.690	MS5503	0
M35	FRONT	SHADED	8.54200	0.99958	1782.000	78474.130	57878.950	MS5503	0
M60	MOVER		14.54120	1.00000	1736.000	.	.	MS5503	0
M60	REAR	SHADED	6.40880	0.99837	2335.242	77301.210	58849.070	MS5504	0
UH1	RIGHT SIDE	IN OPEN	20.25610	1.00000	2419.179	77218.320	58836.180	MS5504	0
DECOY	FRONT	IN OPEN	12.87550	1.00000	3170.000	77894.760	56585.940	MS5601	0
M35	RIGHT SIDE	IN OPEN	5.47220	0.99649	3015.000	78003.990	56700.860	MS5601	0
M113	RIGHT FRONT	IN OPEN	9.31470	0.99974	3791.000	75865.740	59926.980	MS5602	1
UH1	FRONT	IN OPEN	8.75760	0.99967	3950.000	75702.860	59919.850	MS5602	1
M60	LEFT SIDE	IN OPEN	13.53500	1.00000	4080.000	75576.280	59850.970	MS5602	1
M35	REAR	IN OPEN	11.17530	0.99942	3511.000	77928.700	56170.000	MS5603	0
M35	FRONT	BEHIND TREE	16.15660	1.00000	3550.000	77890.260	56146.420	MS5603	0
ZSU	LEFT SIDE	IN OPEN	14.75810	0.99979	3660.000	77877.480	56029.000	MS5603	0
M60	RIGHT SIDE	IN OPEN	11.85390	0.99981	3041.000	76566.390	59496.020	MS5604	1
M60	RIGHT SIDE	IN OPEN	9.69370	0.99932	3065.000	76538.660	59440.020	MS5604	1
AH1	LEFT REAR	IN OPEN	6.81140	0.99520	2925.000	76676.870	59414.960	MS5604	1
M35	FRONT	SHADED	8.77420	0.99869	3214.000	76387.810	59421.170	MS5604	1
M113	RIGHT SIDE	IN OPEN	7.90240	0.99768	3112.000	76488.520	59382.500	MS5604	1
M113	LEFT SIDE	BEHIND TREES	7.10960	0.99602	3163.000	76435.380	59334.490	MS5604	1
M60	LEFT REAR		13.98080	1.00000	4456.000	.	.	MS5702	1
M113	RIGHT FRONT		7.84360	0.99889	4570.000	.	.	MS5702	1
M60	LEFT FRONT		10.85990	0.99979	4456.000	.	.	MS5702	1
M35	RIGHT FRONT		9.40980	0.99940	4574.000	.	.	MS5702	1
M60	LEFT FRONT		7.13820	0.99790	3880.000	.	.	MS5703	0
M35	FRONT		10.90030	0.99998	3919.000	.	.	MS5703	0
DECOY	N/A		8.09530	0.99575	3809.000	.	.	MS5703	0
M60	RIGHT FRONT		13.79880	1.00000	3909.000	.	.	MS5703	0
M113	RIGHT FRONT		3.09850	0.94873	3991.000	.	.	MS5703	0
M60	RIGHT FRONT		6.00740	0.99912	2469.000	.	.	MS5704	0
M113	RIGHT FRONT		16.22570	1.00000	2348.000	.	.	MS5704	0
M35	LEFT FRONT		8.65866	0.99981	2213.000	.	.	MS5704	0
M35	RIGHT FRONT		9.9150.	0.99792	2657.000	.	.	MS5801	1
M60	LEFT FRONT		8.91500	0.99792	2644.000	.	.	MS5801	1
M113	FRONT		2.78460	0.91292	2612.000	.	.	MS5801	1
M35	RIGHT FRONT		10.81160	0.99998	4596.000	.	.	MS5802	1
M113	RIGHT FRONT		8.01390	0.99979	4565.000	.	.	MS5802	1
DECOY	FRONT		11.27680	1.00000	4456.000	.	.	MS5802	1
M60	RIGHT FRONT		11.27940	1.00000	4574.000	.	.	MS5802	1

TARGET RADAR METRICS

global target prominence measured relative to target-free background

BAND=total power METRIC=signal to clutter (continued)

target	orientation	comment	log metric value	global target prominence	range (meters)	UTM northing (meters)	UTM easting (meters)	test ID	elevation setting
ZSU	REAR		18.57660	1.00000	1481.000	.	.	MS5803	1
M60	REAR		5.74320	0.94943	1352.000	.	.	MS5803	1
M113	FRONT		15.60030	0.99995	1484.000	.	.	MS5803	1
M60	LEFT SIDE		14.59570	0.99986	1376.000	.	.	MS5803	1
M113	FRONT		11.57820	0.99965	4570.000	.	.	MS5804	1
M60	RIGHT SIDE		2.57950	0.94537	4456.000	.	.	MS5804	1
M113	LEFT SIDE	UNDER TREES	8.55770	0.99782	3878.000	79437.000	54153.000	MS6001	1
M35	LEFT FRONT	UNDER TREES	8.24610	0.99713	3898.000	79490.000	54147.000	MS6001	1
M35	LEFT FRONT	UNDER TREES	7.69990	0.99597	3919.000	79570.000	54151.000	MS6001	1
AH1	LEFT SIDE	BEHIND TREETOP	3.05360	0.95807	4184.000	79273.000	53793.000	MS6002	0
M113	UNKNOWN	BEHIND TREETOP	4.84530	0.98415	4138.000	79292.000	53845.000	MS6002	0
M113	UNKNOWN	BEHIND TREETOP	2.84780	0.94903	4170.000	79319.000	53818.000	MS6002	0
M35	RIGHT SIDE	IN OPEN	7.77950	0.99772	3845.000	79466.000	54196.000	MS6002	0
M35	RIGHT SIDE	BEHIND TREETOP	7.00700	0.99584	3852.000	79495.000	54197.000	MS6002	0
M60	LEFT SIDE	IN OPEN	7.25410	0.99623	3843.000	79424.000	54185.000	MS6004	0
M113	RIGHT FRONT	IN OPEN	14.25450	1.00000	3878.000	79437.000	54153.000	MS6004	0
M113	LEFT FRONT	UNDER TREES	6.82060	0.99518	3898.000	79490.000	54147.000	MS6004	0
M35	RIGHT SIDE	IN OPEN	18.85090	1.00000	3919.000	79570.000	54151.000	MS6004	0
M35	FRONT	BEHIND TREETOP	11.38230	0.99942	4184.000	.	.	MS6101	0
M35	RIGHT SIDE	BEHIND TREES	3.32810	0.96819	4169.000	79397.000	53839.000	MS6101	0
M60	LEFT SIDE	IN OPEN	5.16020	0.99001	3843.000	79424.000	54185.000	MS6101	0
ZSU	LEFT FRONT	NEAR TREE	6.85870	0.99657	3898.000	79490.000	54147.000	MS6101	0
M60	RIGHT SIDE		12.57250	0.99968	3919.000	.	.	MS6101	0
M113	LEFT FRONT	BEHIND TREETOP	2.22350	0.92290	4142.000	79372.000	53860.000	MS6102	1
M113	FRONT	IN TREES	16.37040	1.00000	3898.000	79490.000	54147.000	MS6102	1
ZSU	LEFT SIDE		9.44560	0.99810	3919.000	.	.	MS6102	1
M60	LEFT FRONT		20.11020	1.00000	1969.000	.	.	MS63011	0
M60	RIGHT FRONT	IN OPEN	15.61090	0.99981	1963.000	78576.000	55922.000	MS63011	0
M60	LEFT FRONT	IN OPEN	14.53160	0.99871	1922.000	78598.000	55966.000	MS63011	0
M60	LEFT FRONT	IN OPEN	26.21750	1.00000	1985.000	78620.000	55906.000	MS63011	0
ZSU	FRONT	IN OPEN	12.58830	0.99926	3130.000	79143.000	54847.000	MS63012	0
M113	RIGHT SIDE	FRONT OF TREES	12.71200	0.99928	3090.000	79173.000	54896.000	MS63012	0
UH1	REAR	IN OPEN	8.17440	0.99516	3045.000	79175.000	54944.000	MS63012	0
M113	LEFT SIDE	IN OPEN	19.13150	1.00000	3078.000	79208.000	54919.000	MS63012	0
M60	LEFT SIDE	TOP SHOWING	29.38600	1.00000	1656.000	79038.000	56371.000	MS6403	0
M60	RIGHT SIDE	TOP SHOWING	30.62450	1.00000	1590.000	79025.000	56438.000	MS6403	0
ZSU	LEFT FRONT	TOP SHOWING	23.28850	1.00000	1510.000	78999.000	56514.000	MS6403	0
M113	RIGHT FRONT	TOP SHOWING	8.43820	0.99797	1646.000	79070.000	56398.000	MS6403	0
UH1	RIGHT REAR	IN OPEN	11.67380	0.99939	1483.000	79013.000	56553.000	MS6403	0
M60	RIGHT FRONT	IN OPEN	13.75420	0.99872	2510.810	79085.000	55475.000	MS6603	0
ZSU	REAR	IN OPEN	15.64860	0.99986	2535.700	79127.000	55462.000	MS6603	0

TARGET RADAR METRICS

global target prominence measured relative to target-free background

BAND=total power METRIC=signal to clutter
(continued)

target	orientation	comment	log metric value	global target prominence	range (meters)	UTM northing (meters)	UTM easting (meters)	test ID	elevation setting
M60	LEFT FRONT	WITH BRUSH	6.70750	0.99030	2494.040	79165.000	55519.000	MS6603	0
M113	LEFT FRONT	IN OPEN	4.09750	0.95589	2490.270	79182.000	55533.000	MS6603	0
M113	RIGHT FRONT	IN OPEN	7.69180	0.99020	2333.730	78471.000	55541.000	MS6701	0
ZSU	REAR	IN OPEN	7.78620	0.99073	2380.870	78504.000	55496.000	MS6701	0
M35	LEFT SIDE	PART BEHIND HILL	2.83750	0.87386	2414.820	78558.000	55466.000	MS6701	0

TARGET RADAR METRICS

global target prominence measured relative to target-free background

BAND=total power METRIC=variance

target	orientation	comment	log metric value	global target prominence	range (meters)	UTM northing (meters)	UTM easting (meters)	test ID	elevation setting
M113	FRONT	IN OPEN	3.60450	0.99666	4204.000	75642.540	60686.090	MS5502	0
M60	REAR	IN OPEN	8.70060	0.99926	4298.000	75544.870	60691.750	MS5502	0
M60	RIGHT FRONT	IN OPEN	-0.56820	0.98000	4166.000	75641.670	60568.220	MS5502	0
M35	LEFT FRONT	IN OPEN	15.74550	1.00000	4120.000	75653.160	60451.570	MS5502	0
ZSU	FRONT	SHADED	12.23960	1.00000	1703.000	78488.700	57870.690	MS5503	0
M35	FRONT	SHADED	1.01780	0.97093	1782.000	78474.130	57878.950	MS5503	0
M60	MOVER		7.00250	1.00000	1738.000	.	.	MS5503	0
M60	REAR	SHADED	3.16720	0.99898	2335.242	77301.210	58849.070	MS5504	0
UH1	RIGHT SIDE	IN OPEN	12.86060	1.00000	2419.179	77218.320	58836.160	MS5504	0
DECOY	FRONT	IN OPEN	3.91700	1.00000	3170.000	77894.780	56585.940	MS5601	0
M35	RIGHT SIDE	IN OPEN	-2.74160	0.93824	3015.000	78003.990	56700.860	MS5601	0
M113	RIGHT FRONT	IN OPEN	-0.32640	0.98723	3791.000	75865.740	59926.980	MS5602	1
UH1	FRONT	IN OPEN	0.32090	0.99137	3950.000	75702.860	59919.850	MS5602	1
M60	LEFT SIDE	IN OPEN	5.74710	0.99998	4080.000	75576.280	59950.970	MS5602	1
M35	REAR	IN OPEN	8.01570	1.00000	3511.000	77928.700	56170.000	MS5603	0
M35	FRONT	BEHIND TREE	4.75700	0.99868	3550.000	77890.260	56146.420	MS5603	0
ZSU	LEFT SIDE	IN OPEN	7.88460	1.00000	3660.000	77877.480	56029.000	MS5603	0
M60	RIGHT SIDE	IN OPEN	4.48270	0.99784	3041.000	76566.390	59486.020	MS5604	1
M60	RIGHT SIDE	IN OPEN	0.53720	0.97378	3065.000	76538.660	59440.020	MS5604	1
AH1	LEFT REAR	IN OPEN	-5.93280	0.75510	2925.000	76676.870	59414.960	MS5604	1
M35	FRONT	SHADED	6.15890	0.99937	3214.000	76387.810	59421.170	MS5604	1
M113	RIGHT SIDE	IN OPEN	3.27910	0.99465	3112.000	76488.520	59382.500	MS5604	1
M113	LEFT SIDE	BEHIND TREES	-0.83990	0.94538	3163.000	76435.380	59334.490	MS5604	1
M60	LEFT REAR		5.35870	0.99848	4456.000	.	.	MS5702	1
M113	RIGHT FRONT		0.38770	0.97846	4570.000	.	.	MS5702	1
M60	LEFT FRONT		4.33710	0.99848	4456.000	.	.	MS5702	1
M35	RIGHT FRONT		1.39380	0.98571	4574.000	.	.	MS5702	1
M60	LEFT FRONT		-0.22820	0.98231	3880.000	.	.	MS5703	0
M35	FRONT		6.75520	1.00000	3919.000	.	.	MS5703	0
DECOY	N/A		-0.17860	0.98231	3809.000	.	.	MS5703	0
M60	RIGHT FRONT		5.77360	1.00000	3909.000	.	.	MS5703	0
M113	RIGHT FRONT		0.10970	0.98641	3991.000	.	.	MS5703	0
M60	RIGHT FRONT		-7.83630	0.71670	2469.000	.	.	MS5704	0
M113	RIGHT FRONT		11.87350	1.00000	2349.000	.	.	MS5704	0
M35	LEFT FRONT		3.16640	1.00000	2213.000	.	.	MS5704	0
M35	RIGHT FRONT		6.89310	1.00000	2657.000	.	.	MS5801	1
M60	LEFT FRONT		0.26000	0.97917	2644.000	.	.	MS5801	1
M113	FRONT		-5.06520	0.86088	2612.000	.	.	MS5801	1
M35	RIGHT FRONT		4.41710	0.99847	4596.000	.	.	MS5802	1
M113	RIGHT FRONT		2.42470	0.99646	4565.000	.	.	MS5802	1
DECOY	FRONT		0.14060	0.98403	4456.000	.	.	MS5802	1
M60	RIGHT FRONT		-4.23210	0.89717	4574.000	.	.	MS5802	1

TARGET RADAR METRICS

global target prominence measured relative to target-free background

BAND=total power METRIC=variance
(continued)

target	orientation	comment	log metric value	global target prominence	range (meters)	UTM northing (meters)	UTM easting (meters)	test ID	elevation setting
ZSU	REAR		13.44820	1.00000	1481.000	.	.	MS5803	1
M60	REAR		-4.85770	0.87960	1352.000	.	.	MS5803	1
M113	FRONT		-0.80860	0.96844	1484.000	.	.	MS5803	1
M60	LEFT SIDE		9.14910	1.00000	1376.000	.	.	MS5803	1
M113	FRONT		10.41580	1.00000	4570.000	.	.	MS5804	1
M60	RIGHT SIDE		4.25580	0.99804	4456.000	.	.	MS5804	1
M113	LEFT SIDE	UNDER TREES	4.88570	0.99817	3876.000	79437.000	54153.000	MS6001	1
M35	LEFT FRONT	UNDER TREES	6.65270	0.99853	3898.000	79490.000	54147.000	MS6001	1
M35	LEFT FRONT	UNDER TREES	5.33890	0.99837	3919.000	79570.000	54151.000	MS6001	1
AB1	LEFT SIDE	BEHIND TREETOP	-15.26170	0.69881	4184.000	79273.000	53793.000	MS6002	0
M113	UNKNOWN	BEHIND TREETOP	-8.76700	0.87402	4138.000	79292.000	53845.000	MS6002	0
M113	UNKNOWN	BEHIND TREETOP	-13.31010	0.76715	4170.000	79319.000	53818.000	MS6002	0
M35	RIGHT SIDE	IN OPEN	5.63560	0.99817	3845.000	79466.000	54196.000	MS6002	0
M35	RIGHT SIDE	BEHIND TREETOP	2.43940	0.99738	3852.000	79495.000	54197.000	MS6002	0
M60	LEFT SIDE	IN OPEN	3.15590	1.00000	3843.000	79424.000	54185.000	MS6004	0
M113	RIGHT FRONT	IN OPEN	7.38800	1.00000	3878.000	79437.000	54153.000	MS6004	0
M113	LEFT FRONT	UNDER TREES	0.92520	0.99861	3898.000	79490.000	54147.000	MS6004	0
M35	RIGHT SIDE	IN OPEN	10.72730	1.00000	3919.000	79570.000	54151.000	MS6004	0
M35	FRONT	BEHIND TREETOP	9.05990	1.00000	4184.000	.	.	MS6101	0
M35	RIGHT SIDE	BEHIND TREES	-4.81360	0.96247	4169.000	79397.000	53839.000	MS6101	0
M60	LEFT SIDE	IN OPEN	5.30400	0.99846	3843.000	79424.000	54185.000	MS6101	0
ZSU	LEFT FRONT	NEAR TREE	0.13390	0.99434	3898.000	79490.000	54147.000	MS6101	0
M60	RIGHT SIDE		4.02340	0.99846	3919.000	.	.	MS6101	0
M113	LEFT FRONT	BEHIND TREETOP	-1.96200	0.97328	4142.000	79372.000	53860.000	MS6102	1
M113	FRONT	IN TREES	11.34360	1.00000	3898.000	79490.000	54147.000	MS6102	1
ZSU	LEFT SIDE		6.11780	1.00000	3919.000	.	.	MS6102	1
M60	LEFT FRONT		7.16820	1.00000	1969.000	.	.	MS63011	0
M60	RIGHT FRONT	IN OPEN	5.51140	1.00000	1963.000	78576.000	55922.000	MS63011	0
M60	LEFT FRONT	IN OPEN	9.81010	1.00000	1922.000	78598.000	55966.000	MS63011	0
M60	LEFT FRONT	IN OPEN	9.47100	1.00000	1985.000	78620.000	55906.000	MS63011	0
ZSU	FRONT	IN OPEN	4.21170	1.00000	3130.000	79143.000	54847.000	MS63012	0
M113	RIGHT SIDE	FRONT OF TREES	5.61210	1.00000	3090.000	79173.000	54896.000	MS63012	0
UH1	REAR	IN OPEN	0.34460	0.99147	3045.000	79175.000	54944.000	MS63012	0
M113	LEFT SIDE	IN OPEN	8.48960	1.00000	3078.000	79208.000	54919.000	MS63012	0
M60	LEFT SIDE	TOP SHOWING	18.47390	1.00000	1656.000	79038.000	56371.000	MS6403	0
M60	RIGHT SIDE	TOP SHOWING	12.48140	1.00000	1590.000	79025.000	56438.000	MS6403	0
ZSU	LEFT FRONT	TOP SHOWING	4.78460	1.00000	1510.000	78999.000	56514.000	MS6403	0
M113	RIGHT FRONT	TOP SHOWING	-2.72160	0.99348	1646.000	79070.000	56398.000	MS6403	0
UH1	RIGHT REAR	IN OPEN	-0.11450	0.99860	1483.000	79013.000	56553.000	MS6403	0
M60	RIGHT FRONT	IN OPEN	7.96650	0.99984	2510.810	79085.000	55475.000	MS6603	0
ZSU	REAR	IN OPEN	10.16610	1.00000	2535.700	79127.000	55462.000	MS6603	0

TARGET RADAR METRICS

global target prominence measured relative to target-free background

BAND=total power METRIC=variance
(continued)

target	orientation	comment	log metric value	global target prominence	range (meters)	UTM northing (meters)	UTM easting (meters)	test ID	elevation setting
M60	LEFT FRONT	WITH BRUSH	3.52800	0.97826	2494.040	79165.000	55519.000	MS6603	0
M113	LEFT FRONT	IN OPEN	1.51920	0.94845	2490.270	79192.000	55533.000	MS6603	0
M113	RIGHT FRONT	IN OPEN	7.57830	0.99929	2333.730	78471.000	55541.000	MS6701	0
M60	REAR	IN OPEN	4.75560	0.99775	2380.870	78504.000	55496.000	MS6701	0
M35	LEFT SIDE	PART BEHIND HILL	-5.21570	0.88435	2414.820	78558.000	55466.000	MS6701	0

TARGET RADAR METRICS

global target prominence measured relative to target-free background

BAND=polarization RR METRIC=measure of power

target	orientation	comment	log metric value	global target prominence	range (meters)	UTM northing (meters)	UTM easting (meters)	test ID	elevation setting
M113	FRONT	IN OPEN	11.95660	0.99980	4204.000	75642.540	60686.090	MS5502	0
M60	REAR	IN OPEN	17.73840	0.99996	4298.000	75544.870	60691.750	MS5502	0
M60	RIGHT FRONT	IN OPEN	9.65850	0.99924	4166.000	75841.670	60568.220	MS5502	0
M35	LEFT FRONT	IN OPEN	28.49080	1.00000	4120.000	75653.160	60451.570	MS5502	0
ZSU	FRONT	SHADED	19.37990	1.00000	1703.000	78488.700	57970.690	MS5503	0
M35	FRONT	SHADED	9.66550	0.99582	1782.000	78474.130	57878.950	MS5503	0
M60	MOVER		18.37570	1.00000	1738.000	.	.	MS5503	0
M60	REAR	SHADED	11.89050	1.00000	2335.242	77301.210	58849.070	MS5504	0
UH1	RIGHT SIDE	IN OPEN	11.04830	1.00000	2419.179	77218.320	58836.180	MS5504	0
DECOY	FRONT	IN OPEN	16.57080	1.00000	3170.000	77894.780	56585.940	MS5601	0
M35	RIGHT SIDE	IN OPEN	3.80600	0.97611	3015.000	78003.990	56700.860	MS5601	0
M113	RIGHT FRONT	IN OPEN	11.62760	0.99991	3791.000	75865.740	59926.980	MS5602	1
UH1	FRONT	IN OPEN	10.26280	0.99983	3950.000	75702.860	59918.850	MS5602	1
M60	LEFT SIDE	IN OPEN	16.30950	1.00000	4080.000	75576.280	59950.970	MS5602	1
M35	REAR	IN OPEN	12.46380	0.99996	3511.000	77928.700	56170.000	MS5603	0
M35	FRONT	BEHIND TREE	11.41740	0.99989	3550.000	77890.260	56146.420	MS5603	0
ZSU	LEFT SIDE	IN OPEN	12.81050	0.99996	3660.000	77877.480	56029.000	MS5603	0
M60	RIGHT SIDE	IN OPEN	12.27710	0.99954	3041.000	76566.390	59496.020	MS5604	1
M60	RIGHT SIDE	IN OPEN	11.53270	0.99910	3085.000	76538.660	59440.020	MS5604	1
AH1	LEFT REAR	IN OPEN	5.82249	0.97993	2925.000	76676.870	59414.960	MS5604	1
M35	FRONT	SHADED	16.03530	1.00000	3214.000	76387.810	59421.170	MS5604	1
M113	RIGHT SIDE	IN OPEN	12.88760	0.99967	3112.000	76488.520	59382.500	MS5604	1
M113	LEFT SIDE	BEHIND TREES	4.84770	0.97002	3163.000	76435.380	59334.490	MS5604	1
M60	LEFT REAR		17.31070	1.00000	4456.000	.	.	MS5702	1
M113	RIGHT FRONT		10.04840	0.99902	4570.000	.	.	MS5702	1
M60	LEFT FRONT		17.31070	1.00000	4456.000	.	.	MS5702	1
M35	RIGHT FRONT		15.00610	1.00000	4574.000	.	.	MS5702	1
M60	LEFT FRONT		10.67850	0.99991	3880.000	.	.	MS5703	0
M35	FRONT		20.23360	1.00000	3919.000	.	.	MS5703	0
DECOY	N/A		6.73570	0.99725	3809.000	.	.	MS5703	0
M60	RIGHT FRONT		15.66710	1.00000	3809.000	.	.	MS5703	0
M113	RIGHT FRONT		8.84820	0.99943	3991.000	.	.	MS5703	0
M60	RIGHT FRONT		0.05230	0.93100	2469.000	.	.	MS5704	0
M113	RIGHT FRONT		23.82700	1.00000	2349.000	.	.	MS5704	0
M35	LEFT FRONT		15.27310	1.00000	2213.000	.	.	MS5704	0
M35	RIGHT FRONT		18.55990	1.00000	2657.000	.	.	MS5801	1
M60	LEFT FRONT		13.83790	1.00000	2644.000	.	.	MS5801	1
M113	FRONT		6.99560	0.99478	2612.000	.	.	MS5801	1
M35	RIGHT FRONT		12.92510	1.00000	4596.000	.	.	MS5802	1
M113	RIGHT FRONT		15.25490	1.00000	4565.000	.	.	MS5802	1
DECOY	FRONT		6.82810	0.99453	4456.000	.	.	MS5802	1
M60	RIGHT FRONT		4.23250	0.98188	4574.000	.	.	MS5802	1

TARGET RADAR METRICS

global target prominence measured relative to target-free background

BAND=polarization RR METRIC=measure of power (continued)

target	orientation	comment	log metric value	global target prominence	range (meters)	UTM northing (meters)	UTM easting (meters)	test ID	elevation setting
ZSU	REAR		27.89460	1.00000	1481.000	.	.	MS5803	1
M60	REAR		3.43800	0.97334	1352.000	.	.	MS5803	1
M113	FRONT		6.58070	0.99109	1484.000	.	.	MS5803	1
M60	LEFT SIDE		21.08460	1.00000	1376.000	.	.	MS5803	1
M113	FRONT		14.42230	0.99998	4570.000	.	.	MS5804	1
M60	RIGHT SIDE		12.29460	0.99972	4456.000	.	.	MS5804	1
M113	LEFT SIDE	UNDER TREES	13.90430	1.00000	3878.000	79437.000	54153.000	MS6001	1
M35	LEFT FRONT	UNDER TREES	19.97950	1.00000	3898.000	79490.000	54147.000	MS6001	1
M35	LEFT FRONT	UNDER TREES	13.45750	1.00000	3919.000	79570.000	54151.000	MS6001	1
AH1	LEFT SIDE	BEHIND TREETOP	-6.38860	0.90658	4184.000	79273.000	53793.000	MS6002	0
M113	UNKNOWN	BEHIND TREETOP	-1.60610	0.97311	4138.000	79292.000	53845.000	MS6002	0
M113	UNKNOWN	BEHIND TREETOP	-3.07290	0.95922	4170.000	79319.000	53818.000	MS6002	0
M35	RIGHT SIDE	IN OPEN	12.64330	1.00000	3845.000	79466.000	54196.000	MS6002	0
M35	RIGHT SIDE	BEHIND TREETOP	13.18960	1.00000	3852.000	79495.000	54197.000	MS6002	0
M60	LEFT SIDE	IN OPEN	10.62820	0.99994	3843.000	79424.000	54185.000	MS6004	0
M113	RIGHT FRONT	IN OPEN	20.04990	1.00000	3878.000	79437.000	54153.000	MS6004	0
M113	LEFT FRONT	UNDER TREES	4.86980	0.99854	3898.000	79490.000	54147.000	MS6004	0
M35	RIGHT SIDE	IN OPEN	15.27830	1.00000	3919.000	79570.000	54151.000	MS6004	0
M35	FRONT	BEHIND TREETOP	16.97380	1.00000	4184.000	.	.	MS6101	0
M35	RIGHT SIDE	BEHIND TREES	4.78690	0.99774	4169.000	79397.000	53839.000	MS6101	0
M60	LEFT SIDE	IN OPEN	15.37230	1.00000	3843.000	79424.000	54185.000	MS6101	0
ZSU	LEFT FRONT	NEAR TREE	13.34380	1.00000	3898.000	79490.000	54147.000	MS6101	0
M60	RIGHT SIDE		11.34250	0.99996	3919.000	.	.	MS6101	0
M113	LEFT FRONT	BEHIND TREETOP	4.94700	0.99720	4142.000	79372.000	53860.000	MS6102	1
M113	FRONT	IN TREES	21.78440	1.00000	3898.000	79490.000	54147.000	MS6102	1
ZSU	LEFT SIDE		18.87450	1.00000	3919.000	.	.	MS6102	1
M60	LEFT FRONT		18.11810	1.00000	1969.000	.	.	MS63011	0
M60	RIGHT FRONT	IN OPEN	16.50870	1.00000	1963.000	78576.000	55922.000	MS63011	0
M60	LEFT FRONT	IN OPEN	21.70130	1.00000	1922.000	78598.000	55966.000	MS63011	0
M60	LEFT FRONT	IN OPEN	19.44240	1.00000	1985.000	78620.000	55905.000	MS63011	0
ZSU	FRONT	IN OPEN	10.42120	0.99983	3130.000	79143.000	54847.000	MS63012	0
M113	RIGHT SIDE	FRONT OF TREES	10.71630	0.99989	3090.000	79173.000	54896.000	MS63012	0
UH1	REAR	IN OPEN	8.82260	0.99941	3045.000	79175.000	54944.000	MS63012	0
M113	LEFT SIDE	IN OPEN	13.94520	1.00000	3078.000	79208.000	54919.000	MS63012	0
M60	LEFT SIDE	TOP SHOWING	16.82790	1.00000	1656.000	79038.000	56371.000	MS6403	0
M60	RIGHT SIDE	TOP SHOWING	21.88010	1.00000	1590.000	79025.000	56438.000	MS6403	0
ZSU	LEFT FRONT	TOP SHOWING	12.83340	1.00000	1510.000	78999.000	56514.000	MS6403	0
M113	RIGHT FRONT	TOP SHOWING	3.71710	0.99451	1646.000	79070.000	56398.000	MS6403	0
UH1	RIGHT REAR	IN OPEN	10.28910	0.99988	1483.000	79013.000	56553.000	MS6403	0
M60	RIGHT FRONT	IN OPEN	18.79430	1.00000	2510.810	79085.000	55475.000	MS6603	0
ZSU	REAR	IN OPEN	20.76600	1.00000	2535.700	79127.000	55462.000	MS6603	0

TARGET RADAR METRICS

global target prominence measured relative to target-free background

BAND=polarization RR METRIC=measure of power
(continued)

target	orientation	comment	log metric value	global target prominence	range (meters)	UTM northing (meters)	UTM easting (meters)	test ID	elevation setting
M60	LEFT FRONT	WITH BRUSH	8.03300	0.97445	2494.040	79165.000	55519.000	MS6603	0
M113	LEFT FRONT	IN OPEN	10.61260	0.98860	2490.270	79192.000	55533.000	MS6603	0
M113	RIGHT FRONT	IN OPEN	23.16820	1.00000	2333.730	78471.000	55541.000	MS6701	0
ZSU	REAR	IN OPEN	15.62080	0.99998	2380.870	78504.000	55496.000	MS6701	0
M35	LEFT SIDE	PART BEHIND HILL	3.41410	0.98545	2414.820	78558.000	55466.000	MS6701	0

TARGET RADAR METRICS

global target prominence measured relative to target-free background

BAND=polarization RR METRIC=signal to clutter

target	orientation	comment	log metric value	global target prominence	range (meters)	UTM northing (meters)	UTM easting (meters)	test ID	elevation setting
M113	FRONT	IN OPEN	8.33520	0.99895	4204.000	75642.540	60686.090	MS5502	0
M60	REAR	IN OPEN	0.15200	0.62512	4298.000	75544.870	60691.750	MS5502	0
M60	RIGHT FRONT	IN OPEN	13.92810	0.99963	4166.000	75641.670	60568.220	MS5502	0
M35	LEFT FRONT	IN OPEN	24.17860	1.00000	4120.000	75653.160	60451.570	MS5502	0
ZSU	FRONT	SHADED	13.71100	1.00000	1703.000	78488.700	57870.690	MS5503	0
M35	FRONT	SHADED	8.62030	0.99977	1782.000	78474.130	57878.950	MS5503	0
M60	MOVER		16.50530	1.00000	1738.000	.	.	MS5503	0
M60	REAR	SHADED	8.83510	0.99950	2335.242	77301.210	58849.070	MS5504	0
UH1	RIGHT SIDE	IN OPEN	12.31000	1.00000	2419.179	77218.320	58836.180	MS5504	0
DECOY	FRONT	IN OPEN	14.62850	1.00000	3170.000	77894.780	56585.940	MS5601	0
M35	RIGHT SIDE	IN OPEN	3.90470	0.97378	3015.000	78003.980	56700.860	MS5601	0
M113	RIGHT FRONT	IN OPEN	10.14620	0.99984	3791.000	75865.740	59926.980	MS5602	1
UH1	FRONT	IN OPEN	10.72910	0.99984	3950.000	75702.860	59919.850	MS5602	1
M60	LEFT SIDE	IN OPEN	15.07620	1.00000	4080.000	75576.280	59950.970	MS5602	1
M35	REAR	IN OPEN	9.25110	0.99946	3511.000	77928.700	56170.000	MS5603	0
M35	FRONT	BEHIND TREE	12.27530	0.99958	3550.000	77890.260	56146.420	MS5603	0
ZSU	LEFT SIDE	IN OPEN	12.71220	0.99967	3660.000	77877.480	56029.000	MS5603	0
M60	RIGHT SIDE	IN OPEN	12.35210	0.99991	3041.000	76566.390	59496.020	MS5604	1
M60	RIGHT SIDE	IN OPEN	10.55370	0.99984	3065.000	76538.660	59440.020	MS5604	1
AH1	LEFT REAR	IN OPEN	8.90000	0.99885	2925.000	76676.870	59414.860	MS5604	1
M35	FRONT	SHADED	6.98260	0.99899	3214.000	76387.810	59421.170	MS5604	1
M113	RIGHT SIDE	IN OPEN	9.08110	0.99911	3112.000	76488.520	59382.500	MS5604	1
M113	LEFT SIDE	BEHIND TREES	3.08840	0.92186	3163.000	76435.360	59334.490	MS5604	1
M60	LEFT REAR		17.41400	1.00000	4456.000	.	.	MS5702	1
M113	RIGHT FRONT		6.59480	0.99916	4570.000	.	.	MS5702	1
M60	LEFT FRONT		13.75840	0.99995	4456.000	.	.	MS5702	1
M35	RIGHT FRONT		12.20550	0.99967	4574.000	.	.	MS5702	1
M60	LEFT FRONT		8.00190	0.99904	3860.000	.	.	MS5703	0
M35	FRONT		13.32870	1.00000	3919.000	.	.	MS5703	0
DECOY	N/A		4.28780	0.98114	3809.000	.	.	MS5703	0
M60	RIGHT FRONT		16.97890	1.00000	3909.000	.	.	MS5703	0
M113	RIGHT FRONT		4.92300	0.98920	3991.000	.	.	MS5703	0
M60	RIGHT FRONT		4.43100	0.99229	2469.000	.	.	MS5704	0
M113	RIGHT FRONT		17.86160	1.00000	2349.000	.	.	MS5704	0
M35	LEFT FRONT		8.74440	1.00000	2213.000	.	.	MS5704	0
M35	RIGHT FRONT		12.73180	0.99952	2657.000	.	.	MS5801	1
M60	LEFT FRONT		12.73180	0.99952	2644.000	.	.	MS5801	1
M113	FRONT		5.09540	0.97937	2612.000	.	.	MS5801	1
M35	RIGHT FRONT		12.71400	1.00000	4596.000	.	.	MS5802	1
M113	RIGHT FRONT		11.87990	1.00000	4565.000	.	.	MS5802	1
DECOY	FRONT		5.95580	0.99872	4456.000	.	.	MS5802	1
M60	RIGHT FRONT		7.38650	1.00000	4574.000	.	.	MS5802	1

TARGET RADAR METRICS

global target prominence measured relative to target-free background

BAND=polarization RR METRIC=signal to clutter
(continued)

target	orientation	comment	log metric value	global target prominence	range (meters)	UTM northing (meters)	UTM easting (meters)	test ID	elevation setting
ZSU	REAR		22.06770	1.00000	1481.000	.	.	MS5803	1
M60	REAR		3.88070	0.95721	1352.000	.	.	MS5803	1
M113	FRONT		13.84620	0.99972	1484.000	.	.	MS5803	1
M60	LEFT SIDE		15.89180	1.00000	1376.000	.	.	MS5803	1
M113	FRONT		5.71290	0.99813	4570.000	.	.	MS5804	1
M60	RIGHT SIDE		2.79030	0.93728	4456.000	.	.	MS5804	1
M113	LEFT SIDE	UNDER TREES	10.47070	1.00000	3878.000	79437.000	54153.000	MS6001	1
M35	LEFT FRONT	UNDER TREES	12.30030	1.00000	3898.000	79490.000	54147.000	MS6001	1
M35	LEFT FRONT	UNDER TREES	9.00510	0.99972	3919.000	79570.000	54151.000	MS6001	1
AH1	LEFT SIDE	BEHIND TREETOP	3.92220	0.97545	4184.000	79273.000	53793.000	MS6002	0
M113	UNKNOWN	BEHIND TREETOP	2.59270	0.92608	4138.000	79292.000	53845.000	MS6002	0
M113	UNKNOWN	BEHIND TREETOP	2.69880	0.93194	4170.000	79319.000	53818.000	MS6002	0
M35	RIGHT SIDE	IN OPEN	5.34520	0.99200	3845.000	79466.000	54196.000	MS6002	0
M35	RIGHT SIDE	BEHIND TREETOP	5.19410	0.99131	3852.000	79495.000	54197.000	MS6002	0
M60	LEFT SIDE	IN OPEN	5.14880	0.99528	3843.000	79424.000	54185.000	MS6004	0
M113	RIGHT FRONT	IN OPEN	16.20030	1.00000	3878.000	79437.000	54153.000	MS6004	0
M113	LEFT FRONT	UNDER TREES	5.28640	0.99486	3898.000	79490.000	54147.000	MS6004	0
M35	RIGHT SIDE	IN OPEN	15.46180	1.00000	3919.000	79570.000	54151.000	MS6004	0
M35	FRONT	BEHIND TREETOP	12.89890	0.99991	4184.000	.	.	MS6101	0
M35	RIGHT SIDE	BEHIND TREES	5.41190	0.99330	4169.000	79397.000	53839.000	MS6101	0
M60	LEFT SIDE	IN OPEN	6.16970	0.99678	3843.000	79424.000	54185.000	MS6101	0
ZSU	LEFT FRONT	NEAR TREE	10.67020	0.99984	3898.000	79490.000	54147.000	MS6101	0
M60	RIGHT SIDE		14.41360	1.00000	3919.000	.	.	MS6101	0
M113	LEFT FRONT	BEHIND TREETOP	4.65480	0.98732	4142.000	79372.000	53860.000	MS6102	1
M113	FRONT	IN TREES	18.79540	1.00000	3898.000	79490.000	54147.000	MS6102	1
ZSU	LEFT SIDE		10.61630	0.99981	3919.000	.	.	MS6102	1
M60	LEFT FRONT		22.20340	1.00000	1969.000	.	.	MS63011	0
M60	RIGHT FRONT	IN OPEN	17.50210	1.00000	1963.000	78576.000	55922.000	MS63011	0
M60	LEFT FRONT	IN OPEN	15.58390	0.99994	1922.000	78598.000	55866.000	MS63011	0
M60	LEFT FRONT	IN OPEN	27.20000	1.00000	1985.000	78620.000	55906.000	MS63011	0
ZSU	FRONT	IN OPEN	9.35630	0.99819	3130.000	79143.000	54847.000	MS63012	0
M113	RIGHT SIDE	FRONT OF TREES	10.68880	0.99940	3090.000	79173.000	54896.000	MS63012	0
UH1	REAR	IN OPEN	5.08930	0.98040	3045.000	79175.000	54944.000	MS63012	0
M113	LEFT SIDE	IN OPEN	16.99580	1.00000	3078.000	79208.000	54919.000	MS63012	0
M60	LEFT SIDE	TOP SHOWING	28.79180	1.00000	1656.000	79038.000	56371.000	MS6403	0
M60	RIGHT SIDE	TOP SHOWING	28.43410	1.00000	1590.000	79025.000	56438.000	MS6403	0
ZSU	LEFT FRONT	TOP SHOWING	24.55240	1.00000	1510.000	78999.000	56514.000	MS6403	0
M113	RIGHT FRONT	TOP SHOWING	10.23360	0.99880	1646.000	79070.000	56398.000	MS6403	0
UH1	RIGHT REAR	IN OPEN	12.83070	0.99934	1483.000	79013.000	56553.000	MS6403	0
M60	RIGHT FRONT	IN OPEN	15.24980	0.99981	2510.810	78085.000	55475.000	MS6603	0
ZSU	REAR	IN OPEN	18.86840	1.00000	2535.700	79127.000	55462.000	MS6603	0

TARGET RADAR METRICS

global target prominence measured relative to target-free background

BAND=polarization RR METRIC=signal to clutter
(continued)

target	orientation	comment	log metric value	global target prominence	range (meters)	UTM northing (meters)	UTM easting (meters)	test ID	elevation setting
M60	LEFT FRONT	WITH BRUSH	6.51150	0.98855	2494.040	79165.000	55519.000	MS6603	0
M113	LEFT FRONT	IN OPEN	5.00690	0.97216	2490.270	79192.000	55533.000	MS6603	0
M113	RIGHT FRONT	IN OPEN	11.83580	0.99970	2333.730	78471.000	55541.000	MS6701	0
ZSU	REAR	IN OPEN	6.78510	0.98826	2380.870	78504.000	55496.000	MS6701	0
M35	LEFT SIDE	PART BEHIND HILL	3.97020	0.94528	2414.820	78558.000	55466.000	MS6701	0

TARGET RADAR METRICS

global target prominence measured relative to target-free background

BAND=polarization RR METRIC=variance

target	orientation	comment	log metric value	global target prominence	range (meters)	UTM northing (meters)	UTM easting (meters)	test ID	elevation setting
M113	FRONT	IN OPEN	-2.16820	0.99458	4204.000	75642.540	60696.090	MS5502	0
M60	REAR	IN OPEN	3.95970	0.99919	4298.000	75544.870	60691.750	MS5502	0
M60	RIGHT FRONT	IN OPEN	-3.29390	0.98891	4166.000	75641.670	60568.220	MS5502	0
M35	LEFT FRONT	IN OPEN	15.61200	1.00000	4120.000	75653.160	60451.570	MS5502	0
ZSU	FRONT	SHADED	5.63660	1.00000	1703.000	78488.700	57970.690	MS5503	0
M35	FRONT	SHADED	-3.15400	0.92560	1782.000	78474.130	57878.950	MS5503	0
M60	MOVER		5.90690	1.00000	1738.000	.	.	MS5503	0
M60	REAR	SHADED	0.26170	1.00000	2335.242	77301.210	58849.070	MS5504	0
UH1	RIGHT SIDE	IN OPEN	0.20400	1.00000	2419.179	77218.320	58836.180	MS5504	0
DECOY	FRONT	IN OPEN	0.85220	1.00000	3170.000	77894.780	56585.940	MS5601	0
M35	RIGHT SIDE	IN OPEN	-7.03920	0.79775	3015.000	78003.990	56700.860	MS5601	0
M113	RIGHT FRONT	IN OPEN	-2.20000	0.99653	3781.000	75865.740	59926.980	MS5602	1
UH1	FRONT	IN OPEN	-2.26580	0.99642	3950.000	75702.860	59919.850	MS5602	1
M60	LEFT SIDE	IN OPEN	3.70960	1.00000	4080.000	75576.280	59950.970	MS5602	1
M35	REAR	IN OPEN	0.79950	0.99924	3511.000	77928.700	56170.000	MS5603	0
M35	FRONT	BEHIND TREE	-3.44350	0.99324	3550.000	77890.260	56146.420	MS5603	0
ZSU	LEFT SIDE	IN OPEN	1.58100	0.99924	3660.000	77877.480	56029.000	MS5603	0
M60	RIGHT SIDE	IN OPEN	-0.22410	0.99229	3041.000	76566.390	59496.020	MS5604	1
M60	RIGHT SIDE	IN OPEN	-0.63580	0.99040	3065.000	76538.660	59440.020	MS5604	1
AH1	LEFT REAR	IN OPEN	-6.71570	0.83662	2925.000	76676.870	59414.960	MS5604	1
M35	FRONT	SHADED	2.66240	0.99890	3214.000	76387.810	59421.170	MS5604	1
M113	RIGHT SIDE	IN OPEN	-0.81140	0.98932	3112.000	76488.520	59382.500	MS5604	1
M113	LEFT SIDE	BEHIND TREES	-6.24370	0.85716	3163.000	76435.380	59334.490	MS5604	1
M60	LEFT REAR		4.12030	1.00000	4456.000	.	.	MS5702	1
M113	RIGHT FRONT		-2.78330	0.98130	4570.000	.	.	MS5702	1
M60	LEFT FRONT		3.45550	1.00000	4456.000	.	.	MS5702	1
M35	RIGHT FRONT		0.53550	0.99973	4574.000	.	.	MS5702	1
M60	LEFT FRONT		-3.30720	0.99484	3880.000	.	.	MS5703	0
M35	FRONT		5.50380	1.00000	3918.000	.	.	MS5703	0
DECOY	N/A		-6.92400	0.92904	3809.000	.	.	MS5703	0
M60	RIGHT FRONT		4.53200	1.00000	3909.000	.	.	MS5703	0
M113	RIGHT FRONT		-3.55510	0.99282	3991.000	.	.	MS5703	0
M60	RIGHT FRONT		-11.58660	0.67105	2468.000	.	.	MS5704	0
M113	RIGHT FRONT		9.03750	1.00000	2349.000	.	.	MS5704	0
M35	LEFT FRONT		1.00480	1.00000	2213.000	.	.	MS5704	0
M35	RIGHT FRONT		6.66010	1.00000	2657.000	.	.	MS5801	1
M60	LEFT FRONT		-0.98570	0.99833	2644.000	.	.	MS5801	1
M113	FRONT		-6.17680	0.91987	2612.000	.	.	MS5801	1
M35	RIGHT FRONT		1.12300	1.00000	4396.000	.	.	MS5802	1
M113	RIGHT FRONT		1.15720	1.00000	4565.000	.	.	MS5802	1
DECOY	FRONT		-6.92930	0.91538	4456.000	.	.	MS5802	1
M60	RIGHT FRONT		-10.10080	0.76327	4574.000	.	.	MS5802	1

TARGET RADAR METRICS

global target prominence measured relative to target-free background

BAND=polarization RR METRIC=variance
(continued)

target	orientation	comment	log metric value	global target prominence	range (meters)	UTM northing (meters)	UTM easting (meters)	test ID	elevation setting
ZSU	REAR		12.77130	1.00000	1481.000	.	.	MS5803	1
M60	REAR		-6.90900	0.90014	1352.000	.	.	MS5803	1
M113	FRONT		-6.58480	0.90600	1484.000	.	.	MS5803	1
M60	LEFT SIDE		8.07100	1.00000	1376.000	.	.	MS5803	1
M113	FRONT		0.44200	0.99864	4570.000	.	.	MS5804	1
M60	RIGHT SIDE		0.39520	0.99864	4456.000	.	.	MS5804	1
M113	LEFT SIDE	UNDER TREES	1.00680	1.00000	3878.000	79437.000	54153.000	MS6001	1
M35	LEFT FRONT	UNDER TREES	5.72720	1.00000	3898.000	79490.000	54147.000	MS6001	1
M35	LEFT FRONT	UNDER TREES	0.20230	0.99949	3919.000	79570.000	54151.000	MS6001	1
AH1	LEFT SIDE	BEHIND TREETOP	-17.23520	0.74802	4184.000	79273.000	53793.000	MS6002	0
M113	UNKNOWN	BEHIND TREETOP	-13.14680	0.88364	4138.000	79292.000	53845.000	MS6002	0
M113	UNKNOWN	BEHIND TREETOP	-15.33080	0.83172	4170.000	79319.000	53818.000	MS6002	0
M35	RIGHT SIDE	IN OPEN	0.74470	1.00000	3845.000	79466.000	54196.000	MS6002	0
M35	RIGHT SIDE	BEHIND TREETOP	-0.69070	0.99964	3852.000	79495.000	54197.000	MS6002	0
M60	LEFT SIDE	IN OPEN	-0.77280	1.00000	3843.000	79424.000	54185.000	MS6004	0
M113	RIGHT FRONT	IN OPEN	4.56670	1.00000	3878.000	79437.000	54153.000	MS6004	0
M113	LEFT FRONT	UNDER TREES	-7.04530	0.99295	3898.000	79490.000	54147.000	MS6004	0
M35	RIGHT SIDE	IN OPEN	1.38900	1.00000	3919.000	79570.000	54151.000	MS6004	0
M35	FRONT	BEHIND TREETOP	4.38660	1.00000	4184.000	.	.	MS6101	0
M35	RIGHT SIDE	BEHIND TREES	-7.36440	0.98130	4169.000	79397.000	53839.000	MS6101	0
M60	LEFT SIDE	IN OPEN	2.63760	1.00000	3843.000	79424.000	54185.000	MS6101	0
ZSU	LEFT FRONT	NEAR TREE	-1.06790	0.99978	3898.000	79490.000	54147.000	MS6101	0
M60	RIGHT SIDE		-0.06790	1.00000	3919.000	.	.	MS6101	0
M113	LEFT FRONT	BEHIND TREETOP	-6.32570	0.98326	4142.000	79372.000	53860.000	MS6102	1
M113	FRONT	IN TREES	8.51780	1.00000	3898.000	79490.000	54147.000	MS6102	1
ZSU	LEFT SIDE		4.18390	1.00000	3919.000	.	.	MS6102	1
M60	LEFT FRONT		5.70870	1.00000	1969.000	.	.	MS63011	0
M60	RIGHT FRONT	IN OPEN	3.95380	1.00000	1963.000	78576.000	55922.000	MS63011	0
M60	LEFT FRONT	IN OPEN	7.96110	1.00000	1922.000	78598.000	55966.000	MS63011	0
M60	LEFT FRONT	IN OPEN	6.072 0	1.00000	1985.000	78620.000	55906.000	MS63011	0
ZSU	FRONT	IN OPEN	-0.78560	0.99870	3130.000	79143.000	54847.000	MS63012	0
M113	RIGHT SIDE	FRONT OF TREES	0.35810	1.00000	3090.000	79173.000	54896.000	MS63012	0
UH1	REAR	IN OPEN	-5.09620	0.97457	3045.000	79175.000	54944.000	MS63012	0
M113	LEFT SIDE	IN OPEN	2.68640	1.00000	3078.000	79208.000	54918.000	MS63012	0
M60	LEFT SIDE	TOP SHOWING	5.69550	1.00000	1656.000	79038.000	56371.000	MS6403	0
M60	RIGHT SIDE	TOP SHOWING	8.10820	1.00000	1590.000	79025.000	56438.000	MS6403	0
ZSU	LEFT FRONT	TOP SHOWING	2.97030	1.00000	1510.000	78999.000	56514.000	MS6403	0
M113	RIGHT FRONT	TOP SHOWING	-6.52610	0.97700	1646.000	79070.000	56398.000	MS6403	0
UH1	RIGHT REAR	IN OPEN	-0.61050	0.99989	1483.000	79013.000	56553.000	MS6403	0
M60	RIGHT FRONT	IN OPEN	6.49300	0.99996	2510.810	79085.000	55475.000	MS6603	0
ZSU	REAR	IN OPEN	7.88330	1.00000	2535.700	79127.000	55462.000	MS6603	0

TARGET RADAR METRICS

global target prominence measured relative to target-free background

BAND=polarization RR METRIC=variance (continued)

target	orientation	comment	log metric value	global target prominence	range (meters)	UTM northing (meters)	UTM easting (meters)	test ID	elevation setting
M60	LEFT FRONT	WITH BRUSH	2.10410	0.97971	2494.040	79165.000	55519.000	MS6603	0
M113	LEFT FRONT	IN OPEN	-1.15120	0.93552	2490.270	79192.000	55593.000	MS6603	0
M113	RIGHT FRONT	IN OPEN	7.66980	1.00000	2333.730	78471.000	55541.000	MS6701	0
ZSU	REAR	IN OPEN	0.84080	0.99777	2380.870	78504.000	55496.000	MS6701	0
M35	LEFT SIDE	PART BEHIND HILL	-7.40940	0.93652	2414.820	78558.000	55466.000	MS6701	0

TARGET RADAR METRICS

global target prominence measured relative to target-free background

BAND=polarization LR METRIC=measure of power

target	orientation	comment	log metric value	global target prominence	range (meters)	UTM northing (meters)	UTM easting (meters)	test ID	elevation setting
M113	FRONT	IN OPEN	17.66700	0.99996	4204.000	75642.540	60686.090	MS5502	0
M60	REAR	IN OPEN	18.76400	1.00000	4298.000	75544.870	60691.750	MS5502	0
M60	RIGHT FRONT	IN OPEN	9.60570	0.99438	4166.000	75641.670	60568.220	MS5502	0
M35	LEFT FRONT	IN OPEN	17.45790	0.99993	4120.000	75653.160	60451.570	MS5502	0
ZSU	FRONT	SHADED	24.54280	1.00000	1703.000	78488.700	57870.690	MS5503	0
M35	FRONT	SHADED	12.42780	0.99615	1782.000	78474.130	57878.950	MS5503	0
M60	MOVER		14.77110	0.99932	1738.000	.	.	MS5503	0
M60	REAR	SHADED	15.58370	0.99997	2335.242	77301.210	58849.070	MS5504	0
UH1	RIGHT SIDE	IN OPEN	26.13290	1.00000	2419.179	77218.320	58836.180	MS5504	0
DECOY	FRONT	IN OPEN	16.39150	0.99998	3170.000	77894.780	56585.940	MS5601	0
M35	RIGHT SIDE	IN OPEN	9.52100	0.99266	3015.000	78003.990	56700.860	MS5601	0
M113	RIGHT FRONT	IN OPEN	9.40620	0.99439	3791.000	75865.740	59926.980	MS5602	1
UH1	FRONT	IN OPEN	11.59800	0.99861	3950.000	75702.860	59919.850	MS5602	1
M60	LEFT SIDE	IN OPEN	15.78920	0.99985	4080.000	75576.280	59950.970	MS5602	1
M35	REAR	IN OPEN	21.17470	1.00000	3511.000	77928.700	56170.000	MS5603	0
M35	FRONT	BEHIND TREE	18.56280	0.99998	3550.000	77890.260	56146.420	MS5603	0
ZSU	LEFT SIDE	IN OPEN	19.40530	0.99998	3660.000	77877.480	56029.000	MS5603	0
M60	RIGHT SIDE	IN OPEN	16.38700	0.99980	3041.000	76566.390	59498.020	MS5604	1
M60	RIGHT SIDE	IN OPEN	10.61820	0.99205	3065.000	76538.660	59440.020	MS5604	1
AH1	LEFT REAR	IN OPEN	2.67920	0.88231	2925.000	76676.870	59414.960	MS5604	1
M35	FRONT	SHADED	17.72330	0.99993	3214.000	76387.810	59421.170	MS5604	1
M113	RIGHT SIDE	IN OPEN	17.73670	0.99993	3112.000	76488.520	59382.500	MS5604	1
M113	LEFT SIDE	BEHIND TREES	12.85550	0.99812	3163.000	76435.380	59334.490	MS5604	1
M60	LEFT REAR		14.18660	0.99917	4456.000	.	.	MS5702	1
M113	RIGHT FRONT		14.15880	0.99917	4570.000	.	.	MS5702	1
M60	LEFT FRONT		14.18680	0.99917	4456.000	.	.	MS5702	1
M35	RIGHT FRONT		10.33990	0.99269	4574.000	.	.	MS5702	1
M60	LEFT FRONT		12.72310	0.99913	3880.000	.	.	MS5703	0
M35	FRONT		17.44900	0.99996	3819.000	.	.	MS5703	0
DECOY	N/A		14.71660	0.99987	3809.000	.	.	MS5703	0
M60	RIGHT FRONT		15.65120	0.99993	3909.000	.	.	MS5703	0
M113	RIGHT FRONT		11.68020	0.99828	3991.000	.	.	MS5703	0
M60	RIGHT FRONT		4.61820	0.95546	2469.000	.	.	MS5704	0
M113	RIGHT FRONT		21.80290	1.00000	2349.000	.	.	MS5704	0
M35	LEFT FRONT		13.82520	0.99993	2213.000	.	.	MS5704	0
M35	RIGHT FRONT		12.18090	0.99772	2657.000	.	.	MS5801	1
M60	LEFT FRONT		12.64200	0.99822	2644.000	.	.	MS5801	1
M113	FRONT		7.23020	0.97752	2612.000	.	.	MS5801	1
M35	RIGHT FRONT		13.76600	0.99943	4586.000	.	.	MS5802	1
M113	RIGHT FRONT		12.22530	0.99839	4565.000	.	.	MS5802	1
DECOY	FRONT		15.25920	0.99985	4456.000	.	.	MS5802	1
M60	RIGHT FRONT		9.24870	0.99261	4574.000	.	.	MS5802	1

TARGET RADAR METRICS

global target prominence measured relative to target-free background

BAND=polarization LR METRIC=measure of power (continued)

target	orientation	comment	log metric value	global target prominence	range (meters)	UTM northing (meters)	UTM easting (meters)	test ID	elevation setting
ZSU	REAR		21.45150	1.00000	1481.000	.	.	MS5803	1
M60	REAR		8.90290	0.98462	1352.000	.	.	MS5803	1
M113	FRONT		11.14620	0.99758	1484.000	.	.	MS5803	1
M60	LEFT SIDE		16.07760	0.99891	1376.000	.	.	MS5803	1
M113	FRONT		24.75130	1.00000	4570.000	.	.	MS5804	1
M60	RIGHT SIDE		17.16320	0.99991	4456.000	.	.	MS5804	1
M113	LEFT SIDE	UNDER TREES	16.32840	0.99991	3878.000	79437.000	54133.000	MS6001	1
M35	LEFT FRONT	UNDER TREES	16.20800	0.99978	3898.000	79490.000	54147.000	MS6001	1
M35	LEFT FRONT	UNDER TREES	17.97440	0.99991	3919.000	79570.000	54151.000	MS6001	1
AH1	LEFT SIDE	BEHIND TREETOP	-1.98940	0.92072	4184.000	79273.000	53793.000	MS6002	0
M113	UNKNOWN	BEHIND TREETOP	4.88500	0.98201	4138.000	79292.000	53845.000	MS6002	0
M113	UNKNOWN	BEHIND TREETOP	-1.40640	0.92888	4170.000	79319.000	53818.000	MS6002	0
M35	RIGHT SIDE	IN OPEN	18.99280	0.99993	3845.000	79466.000	54196.000	MS6002	0
M35	RIGHT SIDE	BEHIND TREETOP	13.03400	0.99978	3852.000	79495.000	54197.000	MS6002	0
M60	LEFT SIDE	IN OPEN	16.44250	1.00000	3843.000	79424.000	54185.000	MS6004	0
M113	RIGHT FRONT	IN OPEN	17.95010	1.00000	3878.000	79437.000	54153.000	MS6004	0
M113	LEFT FRONT	UNDER TREES	11.00040	0.99930	3898.000	79490.000	54147.000	MS6004	0
M35	RIGHT SIDE	IN OPEN	20.78940	1.00000	3919.000	79570.000	54151.000	MS6004	0
M35	FRONT	BEHIND TREETOP	19.10570	0.99996	4184.000	.	.	MS6101	0
M35	RIGHT SIDE	BEHIND TREES	8.06670	0.99630	4169.000	79397.000	53839.000	MS6101	0
M60	LEFT SIDE	IN OPEN	16.36580	0.99993	3843.000	79424.000	54185.000	MS6101	0
ZSU	LEFT FRONT	NEAR TREE	12.37620	0.99961	3898.000	79480.000	54147.000	MS6101	0
M60	RIGHT SIDE		12.93680	0.99974	3919.000	.	.	MS6101	0
M113	LEFT FRONT	BEHIND TREETOP	10.15690	0.99737	4142.000	79372.000	53880.000	MS6102	1
M113	FRONT	IN TREES	20.38900	1.00000	3898.000	79490.000	54147.000	MS6102	1
ZSU	LEFT SIDE		13.59870	0.99991	3919.000	.	.	MS6102	1
M60	LEFT FRONT		15.17860	1.00000	1969.000	.	.	MS63011	0
M60	RIGHT FRONT	IN OPEN	11.93880	0.99994	1963.000	78576.000	53922.000	MS63011	0
M60	LEFT FRONT	IN OPEN	19.19210	1.00000	1922.000	78598.000	53986.000	MS63011	0
M60	LEFT FRONT	IN OPEN	21.29690	1.00000	1985.000	78620.000	53906.000	MS63011	0
ZSU	FRONT	IN OPEN	18.08440	1.00000	3130.000	78143.000	54847.000	MS63012	0
M113	RIGHT SIDE	FRONT OF TREES	14.84480	0.99993	3090.000	78173.000	54896.000	MS63012	0
UH1	REAR	IN OPEN	13.05320	0.99972	3045.000	78175.000	54944.000	MS63012	0
M113	LEFT SIDE	IN OPEN	19.36470	1.00000	3078.000	78208.000	54919.000	MS63012	0
M60	LEFT SIDE	TOP SHOWING	31.13380	1.00000	1656.000	79038.000	56371.000	MS6403	0
M60	RIGHT SIDE	TOP SHOWING	21.71140	1.00000	1590.000	79025.000	56438.000	MS6403	0
ZSU	LEFT FRONT	TOP SHOWING	11.90700	0.99996	1510.000	78998.000	56514.000	MS6403	0
M113	RIGHT FRONT	TOP SHOWING	5.87220	0.99818	1646.000	79070.000	56398.000	MS6403	0
UH1	RIGHT REAR	IN OPEN	9.95130	0.99534	1483.000	79013.000	56553.000	MS6403	0
M60	RIGHT FRONT	IN OPEN	15.55490	0.99909	2510.810	79085.000	55475.000	MS6603	0
ZSU	REAR	IN OPEN	17.65240	0.99987	2535.700	79127.000	55462.000	MS6603	0

TARGET RADAR METRICS

global target prominence measured relative to target-free background

BAND=polarization LR METRIC=measure of power
(continued)

target	orientation	comment	log metric value	global target prominence	range (meters)	UTM northing (meters)	UTM easting (meters)	test ID	elevation setting
M60	LEFT FRONT	WITH BRUSH	6.35800	0.94701	2494.040	79165.000	55519.000	MS6603	0
M113	LEFT FRONT	IN OPEN	10.93780	0.98633	2490.270	79192.000	55533.000	MS6603	0
M113	RIGHT FRONT	IN OPEN	11.31910	0.99798	2333.730	78471.000	55541.000	MS6701	0
ZSU	REAR	IN OPEN	15.55070	0.99987	2380.870	78504.000	55496.000	MS6701	0
M35	LEFT SIDE	PART BEHIND HILL	7.07050	0.98705	2414.820	78558.000	55466.000	MS6701	0

TARGET RADAR METRICS

global target prominence measured relative to target-free background

BAND=polarization LR METRIC=signal to clutter

target	orientation	comment	log metric value	global target prominence	range (meters)	UTM northing (meters)	UTM easting (meters)	test ID	elevation setting
M113	FRONT	IN OPEN	11.15890	0.99972	4204.000	75642.540	60686.090	MS5502	0
M60	REAR	IN OPEN	2.78000	0.93156	4298.000	75544.870	60691.750	MS5502	0
M60	RIGHT FRONT	IN OPEN	13.68050	0.99974	4166.000	75641.670	60568.220	MS5502	0
M35	LEFT FRONT	IN OPEN	11.40070	0.99972	4120.000	75653.160	60451.570	MS5502	0
ZSU	FRONT	SHADED	16.52610	1.00000	1703.000	78488.700	57970.680	MS5503	0
M35	FRONT	SHADED	8.56180	0.99853	1782.000	78474.130	57878.950	MS5503	0
M60	MOVER		12.32380	1.00000	1736.000	.	.	MS5503	0
M60	REAR	SHADED	8.31290	0.99931	2335.242	77301.210	58849.070	MS5504	0
UH1	RIGHT SIDE	IN OPEN	22.22880	1.00000	2419.178	77218.320	58836.180	MS5504	0
DECOY	FRONT	IN OPEN	11.68300	1.00000	3170.000	77894.780	56585.940	MS5601	0
M35	RIGHT SIDE	IN OPEN	6.68400	0.99799	3015.000	78003.990	56700.860	MS5601	0
M113	RIGHT FRONT	IN OPEN	8.44980	0.99875	3791.000	75865.740	59926.980	MS5602	1
UH1	FRONT	IN OPEN	9.01910	0.99921	3950.000	75702.860	59919.850	MS5602	1
M60	LEFT SIDE	IN OPEN	12.11110	1.00000	4080.000	75576.280	59950.970	MS5602	1
M35	REAR	IN OPEN	12.05490	0.99925	3511.000	77928.700	56170.000	MS5603	0
M35	FRONT	BEHIND TREE	17.18740	1.00000	3550.000	77890.260	56146.420	MS5603	0
ZSU	LEFT SIDE	IN OPEN	15.58990	0.99998	3660.000	77877.480	56029.000	MS5603	0
M60	RIGHT SIDE	IN OPEN	11.79950	0.99958	3041.000	76566.390	59496.020	MS5604	1
M60	RIGHT SIDE	IN OPEN	9.66950	0.99862	3065.000	76538.660	59440.020	MS5604	1
AH1	LEFT REAR	IN OPEN	5.41080	0.98472	2925.000	76676.870	59414.980	MS5604	1
M35	FRONT	SHADED	9.46570	0.99845	3214.000	76387.810	58421.170	MS5604	1
M113	RIGHT SIDE	IN OPEN	7.94100	0.99681	3112.000	76488.520	59382.500	MS5604	1
M113	LEFT SIDE	BEHIND TREES	8.33520	0.99756	3163.000	76435.380	59334.490	MS5604	1
M60	LEFT REAR		11.72120	0.99993	4456.000	.	.	MS5702	1
M113	RIGHT FRONT		8.60320	0.99895	4570.000	.	.	MS5702	1
M60	LEFT FRONT		9.84320	0.99928	4456.000	.	.	MS5702	1
M35	RIGHT FRONT		7.61080	0.99847	4574.000	.	.	MS5702	1
M60	LEFT FRONT		7.70690	0.99795	3881.000	.	.	MS5703	0
M35	FRONT		8.16710	0.99855	3918.000	.	.	MS5703	0
DECOY	N/A		7.46370	0.99762	3809.000	.	.	MS5703	0
M60	RIGHT FRONT		12.00300	1.00000	3909.000	.	.	MS5703	0
M113	RIGHT FRONT		4.19080	0.96696	3991.000	.	.	MS5703	0
M60	RIGHT FRONT		6.97400	0.99949	2469.000	.	.	MS5704	0
M113	RIGHT FRONT		15.35350	1.00000	2349.000	.	.	MS5704	0
M35	LEFT FRONT		5.28240	0.99533	2213.000	.	.	MS5704	0
M35	RIGHT FRONT		6.66910	0.98699	2657.000	.	.	MS5801	1
M60	LEFT FRONT		6.66910	0.98699	2644.000	.	.	MS5801	1
M113	FRONT		3.91330	0.93927	2612.000	.	.	MS5801	1
M35	RIGHT FRONT		10.01830	0.99974	4596.000	.	.	MS5802	1
M113	RIGHT FRONT		6.56550	0.99757	4565.000	.	.	MS5802	1
DECOY	FRONT		13.54180	1.00000	4456.000	.	.	MS5802	1
M60	RIGHT FRONT		12.68070	1.00000	4574.000	.	.	MS5802	1

TARGET RADAR METRICS

global target prominence measured relative to target-free background

BAND=polarization LR METRIC=signal to clutter
(continued)

target	orientation	comment	log metric value	global target prominence	range (meters)	UTM northing (meters)	UTM easting (meters)	test ID	elevation setting
ZSU	REAR		15.04370	0.99977	1481.000	.	.	MS5803	1
M60	REAR		7.75870	0.87669	1352.000	.	.	MS5803	1
M113	FRONT		18.42250	0.99993	1484.000	.	.	MS5803	1
M60	LEFT SIDE		12.38230	0.99867	1376.000	.	.	MS5803	1
M113	FRONT		13.38560	0.99977	4570.000	.	.	MS5804	1
M60	RIGHT SIDE		3.19830	0.95094	4456.000	.	.	MS5804	1
M113	LEFT SIDE	UNDER TREES	7.89430	0.99502	3878.000	79437.000	54153.000	MS6001	1
M35	LEFT FRONT	UNDER TREES	5.43160	0.98263	3898.000	79490.000	54147.000	MS6001	1
M35	LEFT FRONT	UNDER TREES	7.88080	0.99463	3919.000	79570.000	54151.000	MS6001	1
AH1	LEFT SIDE	BEHIND TREETOP	3.84030	0.96130	4184.000	79273.000	53793.000	MS6002	0
M113	UNKNOWN	BEHIND TREETOP	6.01970	0.98922	4138.000	79292.000	53845.000	MS6002	0
M113	UNKNOWN	BEHIND TREETOP	3.01510	0.93373	4170.000	79318.000	53818.000	MS6002	0
M35	RIGHT SIDE	IN OPEN	9.09190	0.99819	3845.000	79466.000	54196.000	MS6002	0
M35	RIGHT SIDE	BEHIND TREETOP	7.59690	0.99584	3852.000	79495.000	54197.000	MS6002	0
M60	LEFT SIDE	IN OPEN	8.18650	0.99665	3843.000	79424.000	54185.000	MS6004	0
M113	RIGHT FRONT	IN OPEN	13.35100	0.99990	3878.000	79437.000	54153.000	MS6004	0
M113	LEFT FRONT	UNDER TREES	7.75170	.99585	3898.000	79490.000	54147.000	MS6004	0
M35	RIGHT SIDE	IN OPEN	19.62540	1.00000	3919.000	79570.000	54151.000	MS6004	0
M35	FRONT	BEHIND TREETOP	12.11970	0.99851	4184.000	.	.	MS6101	0
M35	RIGHT SIDE	BEHIND TREES	4.57830	0.98055	4169.000	79397.000	53839.000	MS6101	0
M60	LEFT SIDE	IN OPEN	4.54130	0.97939	3843.000	79424.000	54185.000	MS6101	0
ZSU	LEFT FRONT	NEAR TREE	6.93050	0.99455	3898.000	79490.000	54147.000	MS6101	0
M60	RIGHT SIDE		11.78330	0.99949	3919.000	.	.	MS6101	0
M113	LEFT FRONT	BEHIND TREETOP	3.35180	0.94748	4142.000	79372.000	53860.000	MS6102	1
M113	FRONT	IN TREES	15.12600	1.00000	3898.000	79490.000	54147.000	MS6102	1
ZSU	LEFT SIDE		9.17390	0.99637	3919.000	.	.	MS6102	1
M60	LEFT FRONT		17.75970	0.99984	1969.000	.	.	MS63011	0
M60	RIGHT FRONT	IN OPEN	13.61080	0.99958	1963.000	78576.000	55922.000	MS63011	0
M60	LEFT FRONT	IN OPEN	14.54960	0.99974	1922.000	78598.000	55966.000	MS63011	0
M60	LEFT FRONT	IN OPEN	25.64320	1.00000	1985.000	78620.000	55906.000	MS63011	0
ZSU	FRONT	IN OPEN	14.59250	0.99944	3130.000	79143.000	54847.000	MS63012	0
M113	RIGHT SIDE	FRONT OF TREES	13.99460	0.99930	3090.000	79173.000	54898.000	MS63012	0
UH1	REAR	IN OPEN	9.97160	0.99712	3045.000	79175.000	54944.000	MS63012	0
M113	LEFT SIDE	IN OPEN	20.22610	1.00000	3078.000	79208.000	54919.000	MS63012	0
M60	LEFT SIDE	TOP SHOWING	29.50150	1.00000	1656.000	79038.000	56371.000	MS6403	0
M60	RIGHT SIDE	TOP SHOWING	32.41010	1.00000	1590.000	79025.000	56438.000	MS6403	0
ZSU	LEFT FRONT	TOP SHOWING	22.70160	1.00000	1510.000	78999.000	56514.000	MS6403	0
M113	RIGHT FRONT	TOP SHOWING	9.65150	0.99870	1646.000	79070.000	56398.000	MS6403	0
UH1	RIGHT REAR	IN OPEN	10.92850	0.99941	1483.000	79013.000	56553.000	MS6403	0
M60	RIGHT FRONT	IN OPEN	11.66400	0.99909	2510.810	79085.000	55475.000	MS6603	0
ZSU	REAR	IN OPEN	14.11770	0.99981	2535.700	79127.000	55462.000	MS6603	0

TARGET RADAR METRICS

global target prominence measured relative to target-free background

BAND=polarization LR METRIC=signal to clutter
(continued)

target	orientation	comment	log metric value	global target prominence	range (meters)	UTM northing (meters)	UTM easting (meters)	test ID	elevation setting
M60	LEFT FRONT	WITH BRUSH	7.28500	0.99104	2494.040	79165.000	55519.000	MS6603	0
M113	LEFT FRONT	IN OPEN	3.79390	0.94095	2490.270	79192.000	55533.000	MS6803	0
M113	RIGHT FRONT	IN OPEN	5.69560	0.94304	2333.730	78471.000	55541.000	MS6701	0
ZSU	REAR	IN OPEN	8.38750	0.98779	2380.870	78504.000	55496.000	MS6701	0
M35	LEFT SIDE	PART BEHIND HILL	4.16050	0.90836	2414.820	78558.000	55466.000	MS6701	0

TARGET RADAR METRICS

global target prominence measured relative to target-free background

BAND=polarization LR METRIC=variance

target	orientation	comment	log metric value	global target prominence	range (meters)	UTM northing (meters)	UTM easting (meters)	test ID	elevation setting
M113	FRONT	IN OPEN	2.59660	0.99787	4204.000	75642.540	60686.090	MS5502	0
M60	REAR	IN OPEN	4.33180	0.99919	4298.000	75544.670	60681.750	MS5502	0
M60	RIGHT FRONT	IN OPEN	-3.02320	0.93150	4166.000	75641.670	60568.220	MS5502	0
M35	LEFT FRONT	IN OPEN	4.49330	0.99924	4120.000	75653.160	60451.570	MS5502	0
ZSU	FRONT	SHADED	11.64650	1.00000	1703.000	78468.700	57870.690	MS5503	0
M35	FRONT	SHADED	0.36680	0.98372	1782.000	78474.130	57878.950	MS5503	0
M60	MOVER		2.63040	0.99104	1738.000	.	.	MS5503	0
M60	REAR	SHADED	1.72450	0.99898	2335.242	77301.210	58841.070	MS5504	0
UH1	RIGHT SIDE	IN OPEN	12.80930	1.00000	2419.179	77218.320	58836.180	MS5504	0
DECOY	FRONT	IN OPEN	1.40240	0.99523	3170.000	77894.780	56585.940	MS5601	0
M35	RIGHT SIDE	IN OPEN	-2.53430	0.94423	3015.000	78003.990	56700.860	MS5601	0
M113	RIGHT FRONT	IN OPEN	-3.61380	0.91700	3791.000	75865.740	59926.980	MS5602	1
UH1	FRONT	IN OPEN	-0.52050	0.98240	3950.000	75702.860	59919.850	MS5602	1
M60	LEFT SIDE	IN OPEN	2.80890	0.99745	4080.000	75576.280	59950.970	MS5602	1
M35	REAR	IN OPEN	7.73860	1.00000	3511.000	77928.700	56170.000	MS5603	0
M35	FRONT	BEHIND TREE	4.57440	0.99866	3550.000	77890.260	56146.420	MS5603	0
ZSU	LEFT SIDE	IN OPEN	6.97670	1.00000	3660.000	77877.460	56029.000	MS5603	0
M60	RIGHT SIDE	IN OPEN	3.72560	0.99676	3041.000	76566.390	59496.020	MS5604	1
M60	RIGHT SIDE	IN OPEN	-1.70260	0.81709	3065.000	76538.660	59440.020	MS5604	1
AH1	LEFT REAR	IN OPEN	-8.41530	0.66540	2925.000	76676.870	59414.960	MS5604	1
M35	FRONT	SHADED	5.66140	0.99939	3214.000	76387.810	59421.170	MS5604	1
M113	RIGHT SIDE	IN OPEN	3.42870	0.99519	3112.000	76468.520	59382.500	MS5604	1
M113	LEFT SIDE	BEHIND TREES	-0.02840	0.96649	3163.000	76435.380	59334.490	MS5604	1
M60	LEFT REAR		1.35780	0.98414	4456.000	.	.	MS5702	1
M113	RIGHT FRONT		-0.17840	0.96898	4570.000	.	.	MS5702	1
M60	LEFT FRONT		1.35780	0.98414	4456.000	.	.	MS5702	1
M35	RIGHT FRONT		-2.84330	0.90148	4574.000	.	.	MS5702	1
M60	LEFT FRONT		-0.27860	0.97506	3880.000	.	.	MS5703	0
M35	FRONT		3.31360	1.00000	3919.000	.	.	MS5703	0
DECOY	N/A		0.31960	0.98426	3809.000	.	.	MS5703	0
M60	RIGHT FRONT		3.07620	0.99980	3909.000	.	.	MS5703	0
M113	RIGHT FRONT		0.96390	0.99166	3991.000	.	.	MS5703	0
M60	RIGHT FRONT		-7.72920	0.71207	2469.000	.	.	MS5704	0
M113	RIGHT FRONT		8.90990	1.00000	2349.000	.	.	MS5704	0
M35	LEFT FRONT		1.94060	1.00000	2213.000	.	.	MS5704	0
M35	RIGHT FRONT		-0.18990	0.96734	2657.000	.	.	MS5801	1
M60	LEFT FRONT		0.63670	0.97950	2644.000	.	.	MS5801	1
M113	FRONT		-4.24080	0.88213	2612.000	.	.	MS5801	1
M35	RIGHT FRONT		2.49290	0.99572	4596.000	.	.	MS5802	1
M113	RIGHT FRONT		-0.76500	0.97822	4565.000	.	.	MS5802	1
DECOY	FRONT		0.25950	0.98713	4456.000	.	.	MS5802	1
M60	RIGHT FRONT		-4.59390	0.88457	4574.000	.	.	MS5802	1

TARGET RADAR METRICS

global target prominence measured relative to target-free background

BAND=polarization LR METRIC=variance
(continued)

target	orientation	comment	log metric value	global target prominence	range (meters)	UTM northing (meters)	UTM easting (meters)	test ID	elevation setting
ZSU	REAR		7.31890	1.00000	1481.000	.	.	MS5803	1
M60	REAR		-5.74460	0.88097	1352.000	.	.	MS5803	1
M113	FRONT		-1.26530	0.98638	1484.000	.	.	MS5803	1
M60	LEFT SIDE		3.62550	0.99901	1376.000	.	.	MS5803	1
M113	FRONT		10.21290	1.00000	4570.000	.	.	MS5804	1
M60	RIGHT SIDE		4.54710	0.99897	4456.000	.	.	MS5804	1
M113	LEFT SIDE	UNDER TREES	4.10920	0.99707	3878.000	79437.000	54153.000	MS6001	1
M35	LEFT FRONT	UNDER TREES	3.51770	0.99540	3898.000	79490.000	54147.000	MS6001	1
M35	LEFT FRONT	UNDER TREES	4.19810	0.99719	3919.000	79570.000	54151.000	MS6001	1
AH1	LEFT SIDE	BEHIND TREETOP	-15.19320	0.69889	4184.000	79273.000	53793.000	MS6002	0
M113	UNKNOWN	BEHIND TREETOP	-7.91570	0.89208	4138.000	79292.000	53845.000	MS6002	0
M113	UNKNOWN	BEHIND TREETOP	-13.02650	0.77044	4170.000	79319.000	53818.000	MS6002	0
M35	RIGHT SIDE	IN OPEN	5.16680	0.99866	3845.000	79466.000	54196.000	MS6002	0
M35	RIGHT SIDE	BEHIND TREETOP	2.85100	0.99772	3852.000	79495.000	54197.000	MS6002	0
M60	LEFT SIDE	IN OPEN	3.49120	1.00000	3843.000	79424.000	54185.000	MS6004	0
M113	RIGHT FRONT	IN OPEN	4.64150	1.00000	3878.000	79437.000	54153.000	MS6004	0
M113	LEFT FRONT	UNDER TREES	1.05240	0.99827	3898.000	79490.000	54147.000	MS6004	0
M35	RIGHT SIDE	IN OPEN	10.33000	1.00000	3919.000	79570.000	54151.000	MS6004	0
M35	FRONT	BEHIND TREETOP	7.89270	0.99919	4184.000	.	.	MS6101	0
M35	RIGHT SIDE	BEHIND TREES	-4.66450	0.96299	4169.000	79397.000	53839.000	MS6101	0
M60	LEFT SIDE	IN OPEN	4.58530	0.99846	3843.000	79424.000	54185.000	MS6101	0
ZSU	LEFT FRONT	NEAR TREE	-2.11650	0.98367	3898.000	79490.000	54147.000	MS6101	0
M60	RIGHT SIDE		2.57950	0.99794	3919.000	.	.	MS6101	0
M113	LEFT FRONT	BEHIND TREETOP	-2.02840	0.97049	4142.000	79372.000	53860.000	MS6102	1
M113	FRONT	IN TREES	8.53700	1.00000	3898.000	79490.000	54147.000	MS6102	1
ZSU	LEFT SIDE		4.10780	0.99848	3919.000	.	.	MS6102	1
M60	LEFT FRONT		3.51880	1.00000	1969.000	.	.	MS63011	0
M60	RIGHT FRONT	IN OPEN	1.58600	1.00000	1963.000	78576.000	55922.000	MS63011	0
M60	LEFT FRONT	IN OPEN	6.85930	1.00000	1922.000	78598.000	55966.000	MS63011	0
M60	LEFT FRONT	IN OPEN	7.33470	1.00000	1985.000	78620.000	55906.000	MS63011	0
ZSU	FRONT	IN OPEN	3.38240	1.00000	3130.000	79143.000	54847.000	MS63012	0
M113	RIGHT SIDE	FRONT OF TREES	4.69910	1.00000	3090.000	79173.000	54896.000	MS63012	0
UH1	REAR	IN OPEN	-0.23400	0.98787	3045.000	79175.000	54944.000	MS63012	0
M113	LEFT SIDE	IN OPEN	7.47920	1.00000	3078.000	79208.000	54918.000	MS63012	0
M60	LEFT SIDE	TOP SHOWING	18.31240	1.00000	1656.000	79038.000	56371.000	MS6403	0
M60	RIGHT SIDE	TOP SHOWING	10.88900	1.00000	1590.000	79025.000	56438.000	MS6403	0
ZSU	LEFT FRONT	TOP SHOWING	1.01730	1.00000	1510.000	78999.000	56514.000	MS6403	0
M113	RIGHT FRONT	TOP SHOWING	-4.18540	0.99450	1646.000	79070.000	56398.000	MS6403	0
UH1	RIGHT REAR	IN OPEN	-5.73090	0.98636	1483.000	79013.000	56553.000	MS6403	0
M60	RIGHT FRONT	IN OPEN	4.04960	0.99155	2510.810	79085.000	55475.000	MS6603	0
ZSU	REAR	IN OPEN	6.74720	0.99955	2535.700	79127.000	55462.000	MS6603	0

TARGET RADAR METRICS

global target prominence measured relative to target-free background

BAND=polarization LR METRIC=variance
(continued)

target	orientation	comment	log metric value	global target prominence	range (meters)	UTM northing (meters)	UTM easting (meters)	test ID	elevation setting
M60	LEFT FRONT	WITH BRUSH	0.53990	0.84415	2494.040	79165.000	55519.000	MS6603	0
M113	LEFT FRONT	IN OPEN	-0.12920	0.92941	2480.270	79192.000	55533.000	MS6603	0
M113	RIGHT FRONT	IN OPEN	0.69750	0.99005	2333.730	78471.000	55541.000	MS6701	0
ZSU	REAR	IN OPEN	4.03120	0.99848	2380.870	78504.000	55496.000	MS6701	0
M35	LEFT SIDE	PART BEHIND HILL	-5.18070	0.89207	2414.820	78558.000	55466.000	MS6701	0

TARGET RADAR METRICS

global target prominence measured relative to target-free background

BAND=LR/RR METRIC=polarization ratio

target	orientation	comment	log metric value	global target prominence	range (meters)	UTM northing (meters)	UTM easting (meters)	test ID	elevation setting
M113	FRONT	IN OPEN	6.78580	0.94552	4204.000	75642.540	60686.090	MS5502	0
M60	REAR	IN OPEN	8.92010	0.99088	4298.000	75544.870	60691.750	MS5502	0
M60	RIGHT FRONT	IN OPEN	4.37470	0.75755	4166.000	75641.670	60568.220	MS5502	0
M35	LEFT FRONT	IN OPEN	5.51520	0.86971	4120.000	75653.160	60451.570	MS5502	0
ZSU	FRONT	SHADED	9.46490	0.99842	1703.000	78488.700	57970.690	MS5503	0
M35	FRONT	SHADED	8.59850	0.99084	1782.000	78474.130	57878.950	MS5503	0
M60	MOVER		5.86580	0.90997	1738.000	.	.	MS5503	0
M60	REAR	SHADED	4.85520	0.77102	2335.242	77301.210	58849.070	MS5504	0
UH1	RIGHT SIDE	IN OPEN	16.61450	1.00000	2418.179	77218.320	58836.180	MS5504	0
DECOY	FRONT	IN OPEN	10.66980	0.99784	3170.000	77894.780	56585.940	MS5601	0
M35	RIGHT SIDE	IN OPEN	8.07540	0.97447	3015.000	78003.990	56700.860	MS5601	0
M113	RIGHT FRONT	IN OPEN	8.33130	0.97829	3791.000	75865.740	59926.980	MS5602	1
UH1	FRONT	IN OPEN	8.10990	0.97503	3950.000	75702.860	59919.850	MS5602	1
M60	LEFT SIDE	IN OPEN	9.98190	0.99434	4080.000	75576.280	59950.970	MS5602	1
M35	REAR	IN OPEN	8.73080	0.98579	3511.000	77928.700	56170.000	MS5603	0
M35	FRONT	BEHIND TREE	14.66520	1.00000	3550.000	77890.260	56146.420	MS5603	0
ZSU	LEFT SIDE	IN OPEN	9.84310	0.99447	3660.000	77877.480	56029.000	MS5603	0
M60	RIGHT SIDE	IN OPEN	7.42480	0.97534	3041.000	76566.390	59496.020	MS5604	1
M60	RIGHT SIDE	IN OPEN	5.54050	0.91023	3065.000	76536.660	59440.020	MS5604	1
AH1	LEFT REAR	IN OPEN	3.09970	0.67952	2925.000	76676.870	59414.960	MS5604	1
M35	FRONT	SHADED	9.70680	0.99538	3214.000	76387.810	59421.170	MS5604	1
M113	RIGHT SIDE	IN OPEN	10.07280	0.99669	3112.000	76488.520	59382.500	MS5604	1
M113	LEFT SIDE	BEHIND TREES	10.55180	0.99807	3163.000	76435.380	59334.490	MS5604	1
M60	LEFT REAR		5.60030	0.88856	4456.000	.	.	MS5702	1
M113	RIGHT FRONT		9.08670	0.99334	4570.000	.	.	MS5702	1
M60	LEFT FRONT		9.17240	0.99386	4456.000	.	.	MS5702	1
M35	RIGHT FRONT		4.13550	0.74147	4574.000	.	.	MS5702	1
M60	LEFT FRONT		7.06190	0.91997	3880.000	.	.	MS5703	0
M35	FRONT		7.86990	0.95241	3918.000	.	.	MS5703	0
DECOY	N/A		9.82490	0.98856	3809.000	.	.	MS5703	0
M60	RIGHT FRONT		11.31940	0.99705	3909.000	.	.	MS5703	0
M113	RIGHT FRONT		8.24320	0.86453	3991.000	.	.	MS5703	0
M60	RIGHT FRONT		6.89290	0.94769	2469.000	.	.	MS5704	0
M113	RIGHT FRONT		12.86530	0.99985	2349.000	.	.	MS5704	0
M35	LEFT FRONT		7.51990	0.96726	2213.000	.	.	MS5704	0
M35	RIGHT FRONT		6.63560	0.92685	2657.000	.	.	MS5801	1
M60	LEFT FRONT		7.45380	0.95905	2644.000	.	.	MS5801	1
M113	FRONT		5.11850	0.82393	2612.000	.	.	MS5801	1
M35	RIGHT FRONT		10.33660	0.99803	4596.000	.	.	MS5802	1
M113	RIGHT FRONT		4.66230	0.85636	4565.000	.	.	MS5802	1
DECOY	FRONT		14.58000	0.99991	4456.000	.	.	MS5802	1
M60	RIGHT FRONT		7.42360	0.97924	4574.000	.	.	MS5802	1

TARGET RADAR METRICS

global target prominence measured relative to target-free background

BAND=LR/RR METRIC=polarization ratio
(continued)

target	orientation	comment	log metric value	global target prominence	range (meters)	UTM northing (meters)	UTM easting (meters)	test ID	elevation setting
ZSU	REAR		14.24220	0.99161	1481.000	.	.	MS5803	1
M60	REAR		6.08590	0.75542	1352.000	.	.	MS5803	1
M113	FRONT		10.74400	0.95666	1484.000	.	.	MS5803	1
M60	LEFT SIDE		1.86240	0.30635	1376.000	.	.	MS5803	1
M113	FRONT		15.22790	1.00000	4570.000	.	.	MS5804	1
M60	RIGHT SIDE		7.59710	0.98222	4456.000	.	.	MS5804	1
M113	LEFT SIDE	UNDER TREES	9.41880	0.98394	3878.000	79437.000	54153.000	MS6001	1
M35	LEFT FRONT	UNDER TREES	10.60130	0.98326	3898.000	79490.000	54147.000	MS6001	1
M35	LEFT FRONT	UNDER TREES	9.99460	0.98911	3810.000	79570.000	54151.000	MS6001	1
AH1	LEFT SIDE	BEHIND TREETOP	5.32710	0.85258	4184.000	79273.000	53793.000	MS6002	0
M113	UNKNOWN	BEHIND TREETOP	6.18450	0.90685	4138.000	79292.000	53845.000	MS6002	0
M113	UNKNOWN	BEHIND TREETOP	4.60140	0.81171	4170.000	79319.000	53818.000	MS6002	0
M35	RIGHT SIDE	IN OPEN	8.42700	0.91625	3845.000	79466.000	54196.000	MS6002	0
M35	RIGHT SIDE	BEHIND TREETOP	12.52680	0.99875	3852.000	79495.000	54197.000	MS6002	0
M60	LEFT SIDE	IN OPEN	8.71450	0.98411	3843.000	79424.000	54185.000	MS6004	0
M113	RIGHT FRONT	IN OPEN	8.69320	0.98411	3878.000	79437.000	54153.000	MS6004	0
M113	LEFT FRONT	UNDER TREES	8.03380	0.97354	3898.000	79490.000	54147.000	MS6004	0
M35	RIGHT SIDE	IN OPEN	15.32860	0.99994	3919.000	79570.000	54151.000	MS6004	0
M35	FRONT	BEHIND TREETOP	8.64900	0.98799	4184.000	.	.	MS6101	0
M35	RIGHT SIDE	BEHIND TREES	8.82090	0.98954	4169.000	79397.000	53839.000	MS6101	0
M60	LEFT SIDE	IN OPEN	4.95940	0.88472	3843.000	79424.000	54185.000	MS6101	0
ZSU	LEFT FRONT	NEAR TREE	5.88670	0.93015	3898.000	79490.000	54147.000	MS6101	0
M60	RIGHT SIDE		9.34210	0.99251	3919.000	.	.	MS6101	0
M113	LEFT FRONT	BEHIND TREETOP	7.34930	0.96189	4142.000	79372.000	53860.000	MS6102	1
M113	FRONT	IN TREES	8.24260	0.97712	3898.000	79490.000	54147.000	MS6102	1
ZSU	LEFT SIDE		12.83980	0.99880	3919.000	.	.	MS6102	1
M60	LEFT FRONT		5.97950	0.93969	1969.000	.	.	MS63011	0
M60	RIGHT FRONT	IN OPEN	4.30480	0.82663	1963.000	78576.000	55922.000	MS63011	0
M60	LEFT FRONT	IN OPEN	5.36390	0.90999	1922.000	78598.000	55966.000	MS63011	0
M60	LEFT FRONT	IN OPEN	4.69050	0.86119	1985.000	78620.000	55906.000	MS63011	0
ZSU	FRONT	IN OPEN	6.08440	0.90271	3130.000	79143.000	54847.000	MS63012	0
M113	RIGHT SIDE	FRONT OF TREES	9.70080	0.98951	3090.000	79173.000	54896.000	MS63012	0
UH1	REAR	IN OPEN	8.91910	0.98129	3045.000	79175.000	54944.000	MS63012	0
M113	LEFT SIDE	IN OPEN	8.86360	0.93814	3078.000	79208.000	54919.000	MS63012	0
M60	LEFT SIDE	TOP SHOWING	28.10950	1.00000	1656.000	79038.000	56371.000	MS6403	0
M60	RIGHT SIDE	TOP SHOWING	12.74780	0.99939	1590.000	79025.000	56438.000	MS6403	0
ZSU	LEFT FRONT	TOP SHOWING	4.66440	0.88964	1510.000	78999.000	56514.000	MS6403	0
M113	RIGHT FRONT	TOP SHOWING	3.26420	0.75645	1646.000	79070.000	56398.000	MS6403	0
UH1	RIGHT REAR	IN OPEN	4.22490	0.84981	1483.000	79013.000	56553.000	MS6403	0
M60	RIGHT FRONT	IN OPEN	4.75980	0.84756	2310.810	79085.000	55475.000	MS6603	0
ZSU	REAR	IN OPEN	10.14970	0.99581	2335.700	79127.000	55462.000	MS6603	0

TARGET RADAR METRICS

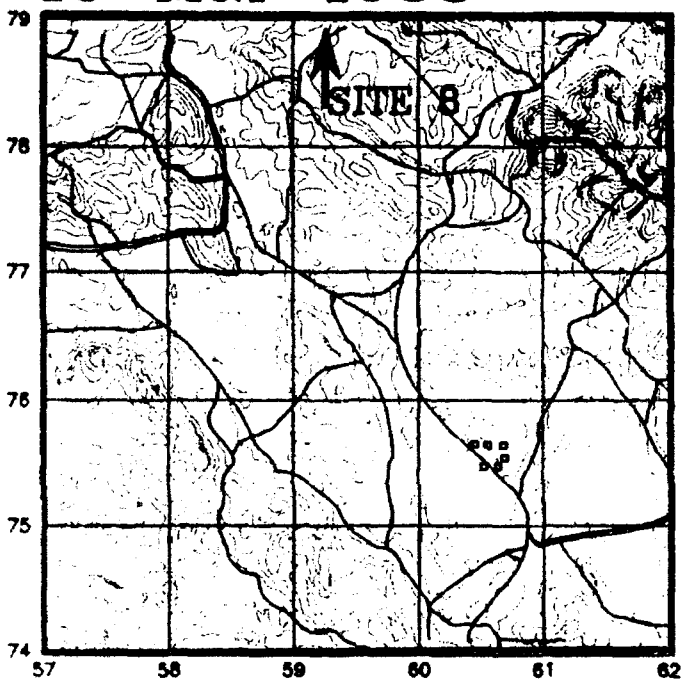
global target prominence measured relative to target-free background

BAND=LR/RR METRIC=polarization ratio
(continued)

target	orientation	comment	log metric value	global target prominence	range (meters)	UTM northing (meters)	UTM easting (meters)	test ID	elevation setting
M60	LEFT FRONT	WITH BRUSH	4.04400	0.77638	2494.040	79165.000	55519.000	MS6603	0
M113	LEFT FRONT	IN OPEN	2.89210	0.64675	2490.270	79192.000	55533.000	MS6603	0
M113	RIGHT FRONT	IN OPEN	5.12710	0.79802	2333.730	78471.000	55541.000	MS6701	0
ZSU	REAR	IN OPEN	8.39680	0.96684	2380.870	78504.000	55496.000	MS6701	0
M35	LEFT SIDE	PART BEHIND HILL	7.00210	0.92145	2414.820	78558.000	55466.000	MS6701	0

Appendix C
Relevant MSFD Test Site Data and Analysis Results

Contained within this appendix is all of the information used to study the radar returns from each of the 24 MSFD test sites for which good data were available. Arranged in numerical order by test number, each packet of information contains a test summary sheet, Charge Coupled Device B&W oblique photographs (if available), a B&W down-looking aerial photo and a 10-ft contour map, both two-dimensional and three dimensional (3-D) linear scale representations of total measured power, slant range-azimuth representations of measured data and filtered data from the target feature metric exercises, range-azimuth representations of backscatter modeling results, and another site contour map with vegetation overlays. The approximate locations of targets for each test are shown as circles on the backscatter prediction results.



15 Mar 1988 0553 Test #MS5502

ENVIRONMENTAL DATA

ATMOSPHERIC

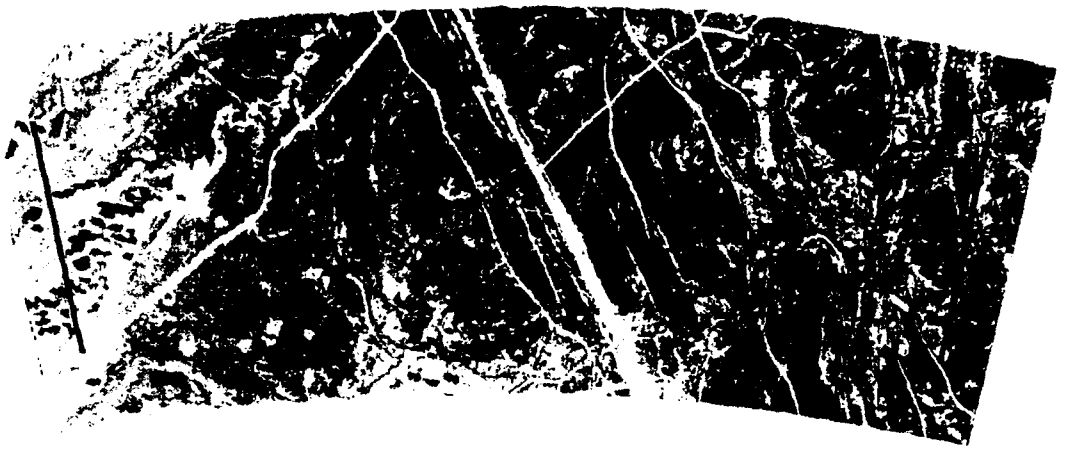
AIR TEMPERATURE	9
RELATIVE HUMIDITY	39
BAROMETRIC PRESSURE	959
SOLAR LOADING	5
OBSERVED CONDITIONS	CLEAR

SCENE

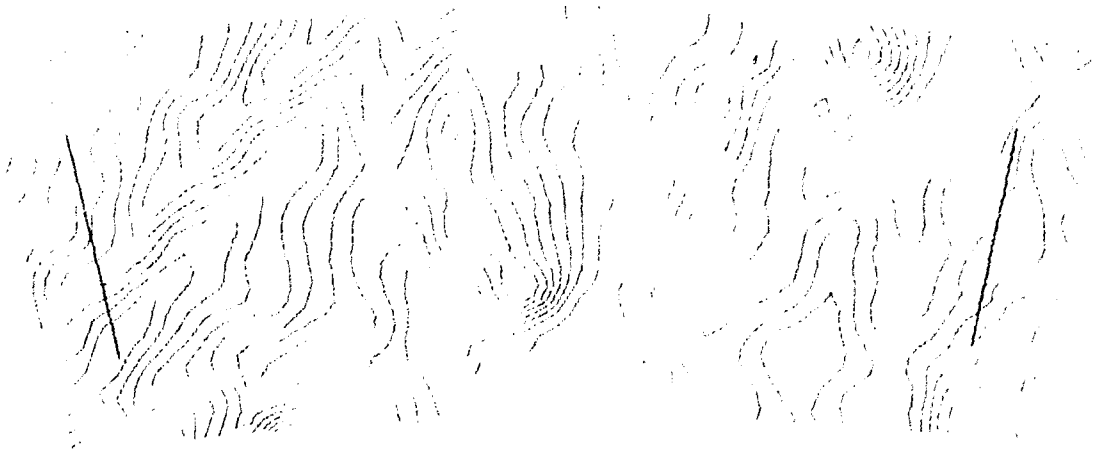
FIELD OF VIEW	SCENE A	SCENE B
AZ	162 7 27	160 17 19
EL	91 54 57	92 33 1
BDA	106.761	110.561
THERMAL		
MEAN	271.563	271.244
MIN	267.356	267.664
MAX	276.479	274.451
STD DEV	0.686	0.748
VISUAL		
MEAN	4.71	60.12
MIN	-1.00	61.00
MAX	305.00	336.00
STD DEV	1.96	6.06

TARGET	TYPE	RANGE	COORDINATES	AZIMUTH	ELEVATION	ORIEN	REMARKS
1202 ▫	M60	4166	60567564	161 36 53	92 41 45	RIGHT FRONT	OPEN
1206 ▫	M60	4296	60697564	160 30 2	92 33 37	REAR	OPEN
1205 ▫	M113	4204	60667564	160 6 29	92 32 42	FRONT	OPEN
1203 ▫	M36	4120	60487565	163 8 23	92 49 22	LEFT FRONT	OPEN
1208 ▫	UH1	4317	60527647	162 55 10	92 44 6	RIGHT SIDE	OPEN
1207 ▫	M113	4349	60647547	161 19 19	92 33 23	RIGHT FRONT	OPEN

Figure C1. Summary data for MS5502 (Sheet 1 of 6)



Overhead photo



Terrain contours (10-ft interval)

Figure C1. (Sheet 2 of 6)

Measured data, linear scale

3-D plot of measured data, linear scale

Figure C1. (Sheet 3 of 6)

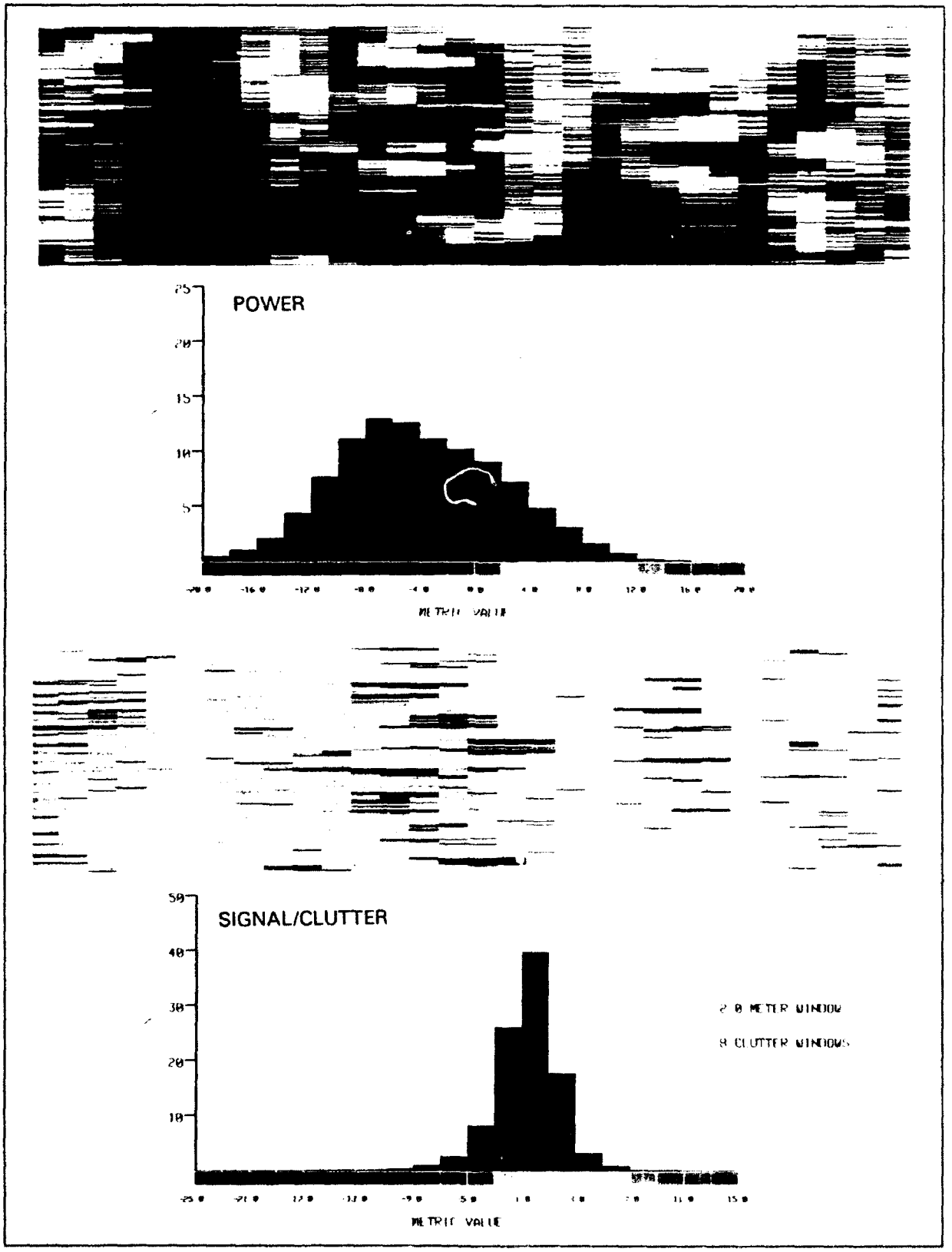


Figure C1. (Sheet 4 of 6)

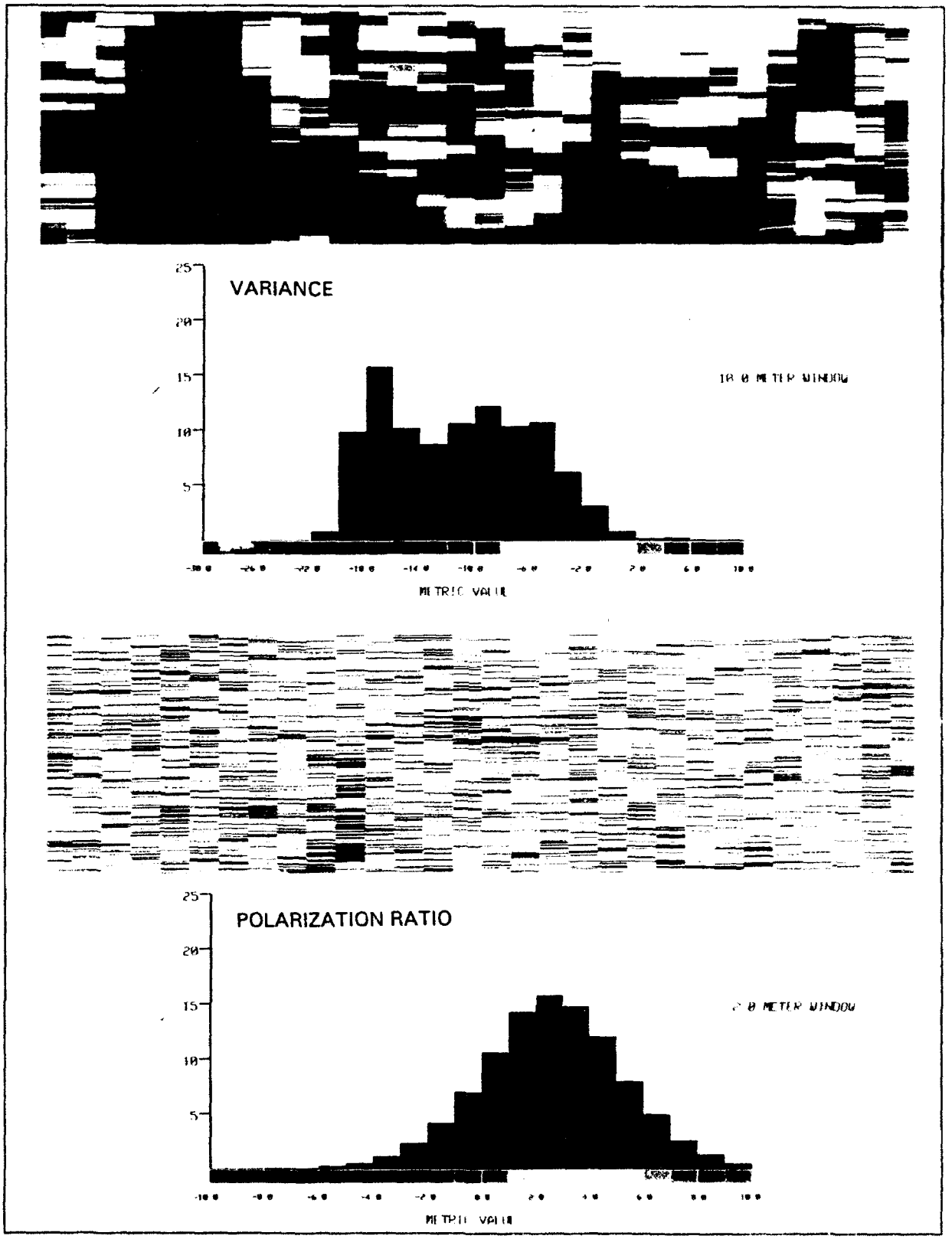


Figure C1. (Sheet 5 of 6)

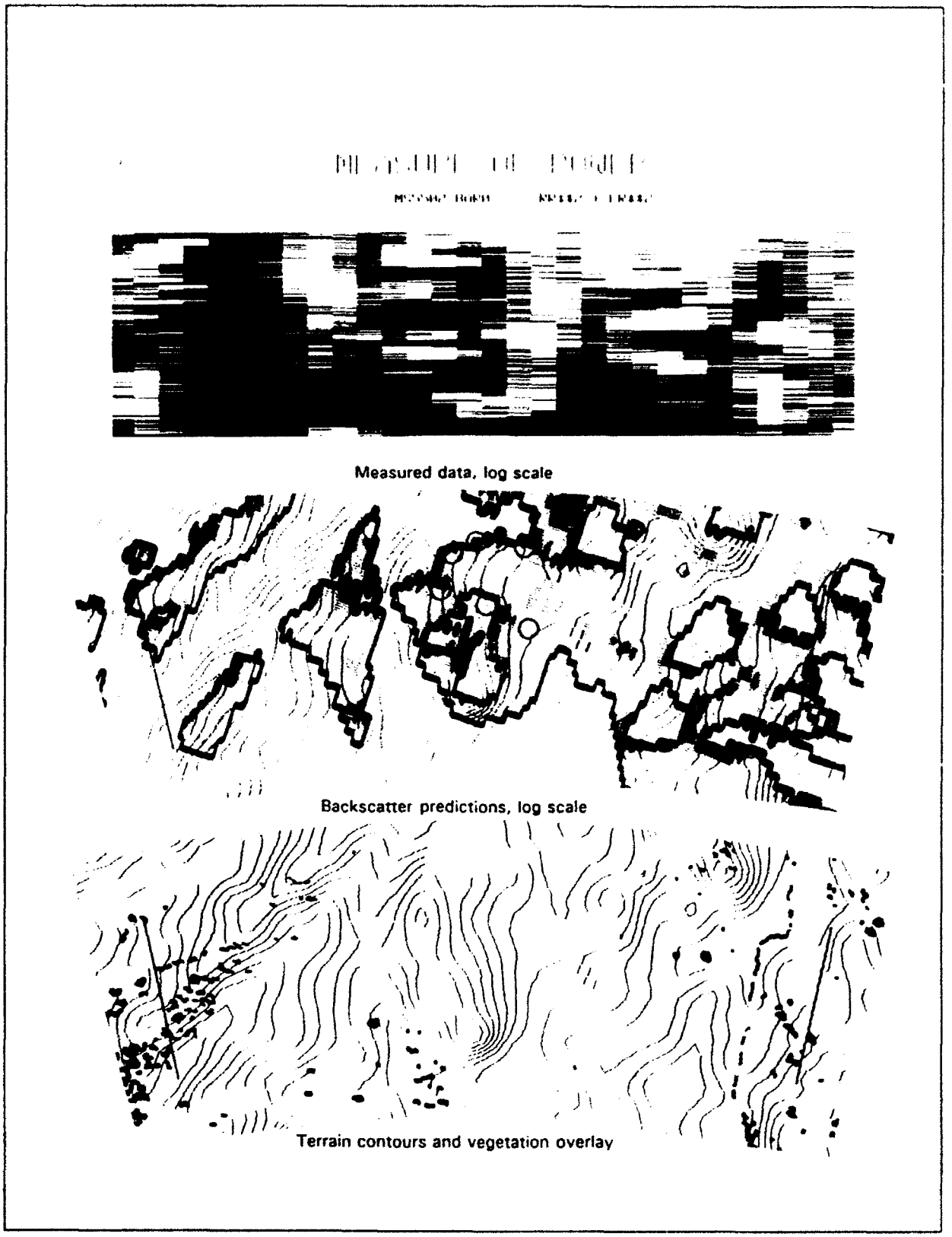


Figure C1. (Sheet 6 of 6)

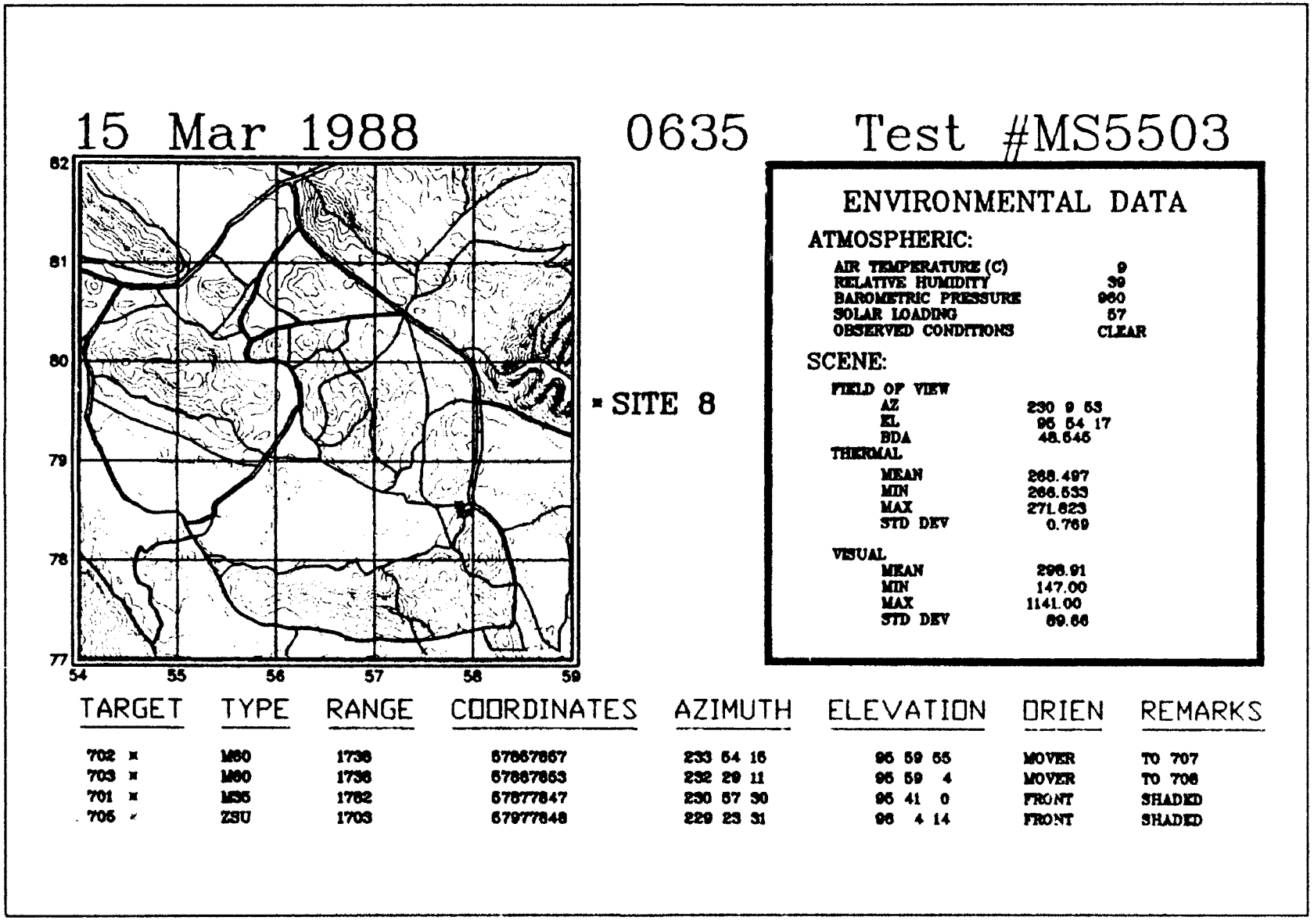
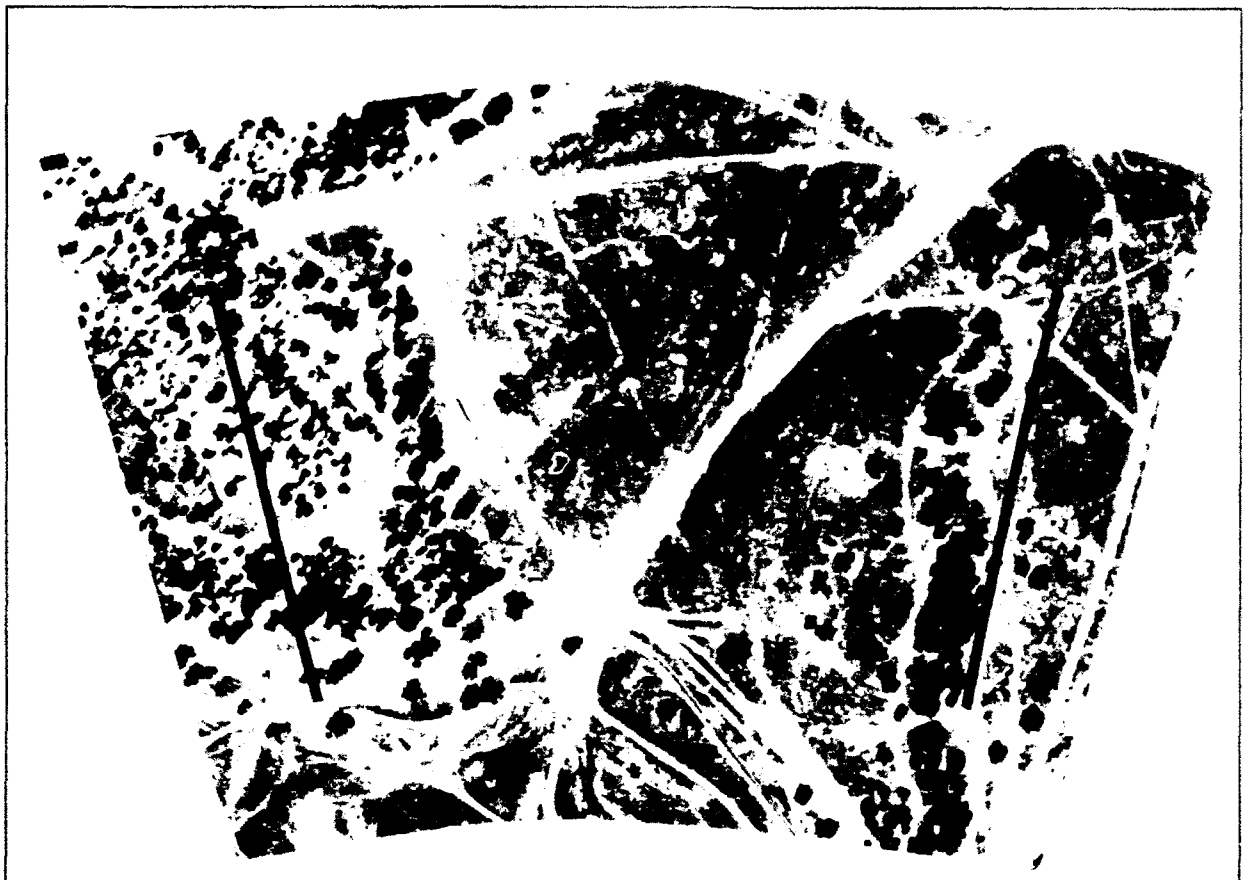


Figure C2. Summary data for MS5503 (Sheet 1 of 7)

CCD photo

Figure C2. (Sheet 2 of 7)

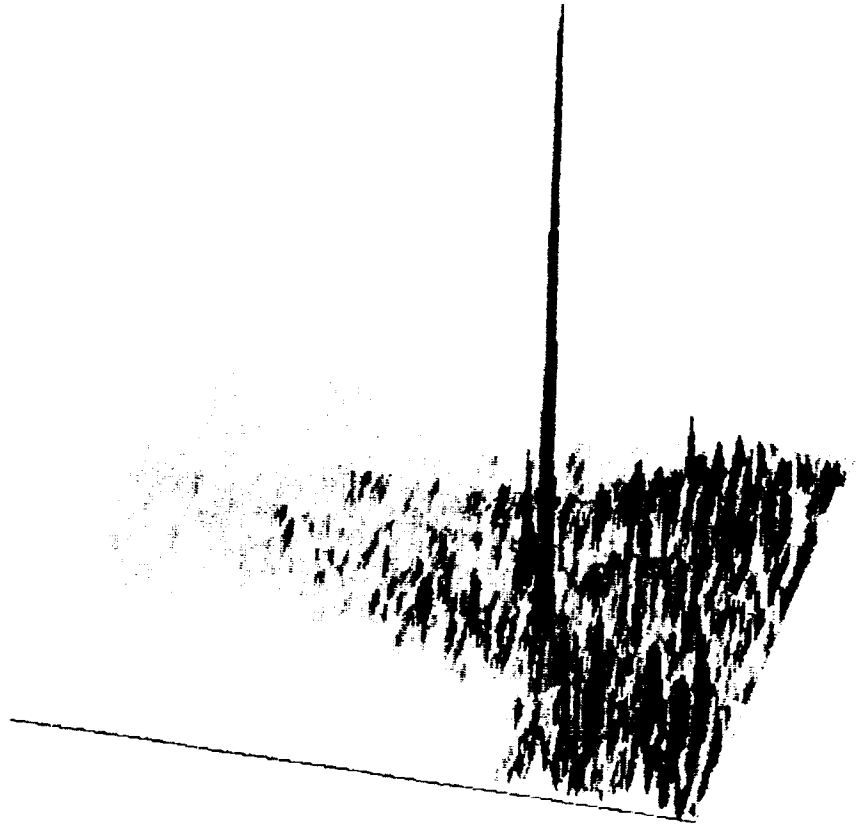


Overhead photo

Terrain contours (10-ft interval)

Figure C2. (Sheet 3 of 7)

Measured data, linear scale



3-D plot of measured data, linear scale

Figure C2. (Sheet 4 of 7)

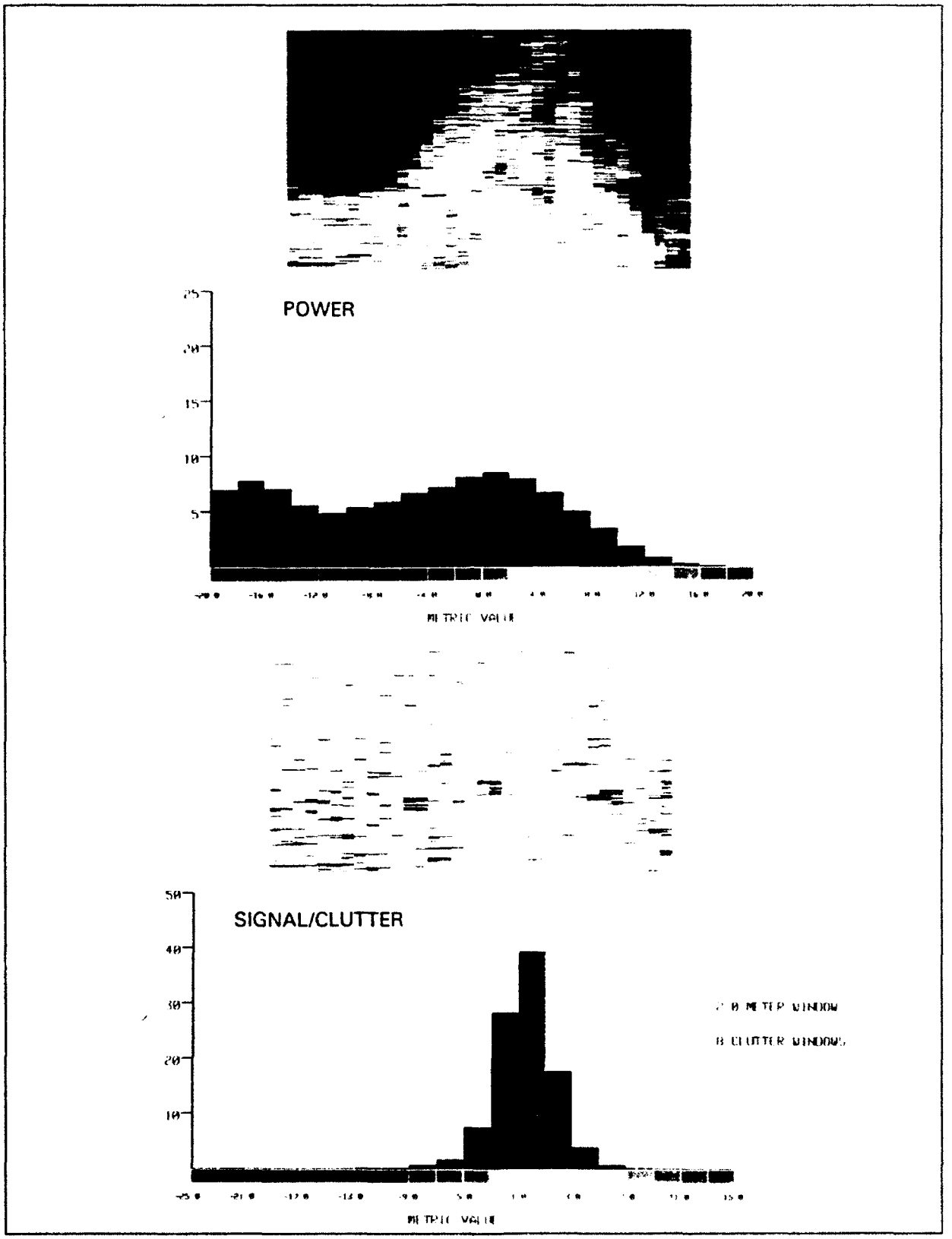


Figure C2. (Sheet 5 of 7)

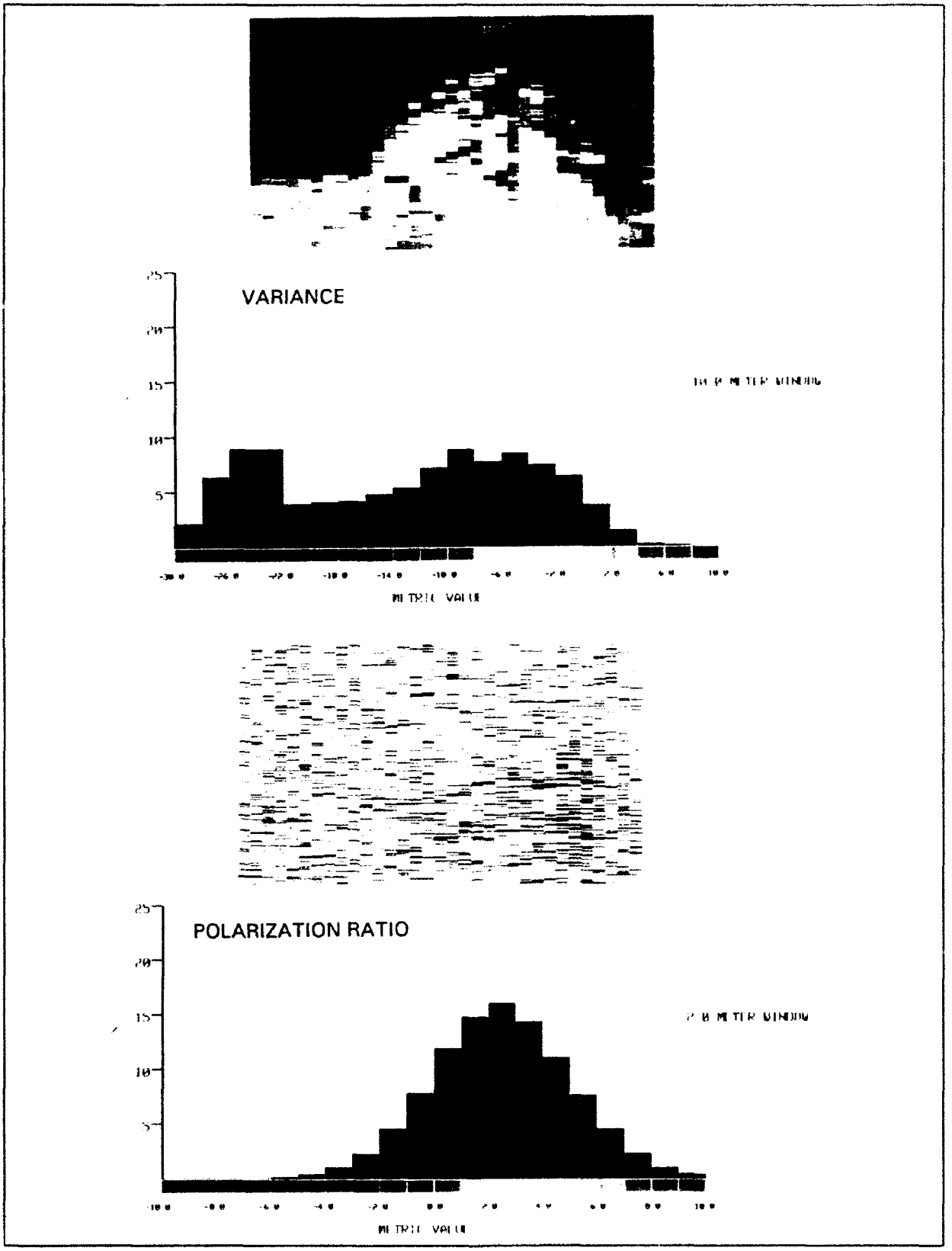
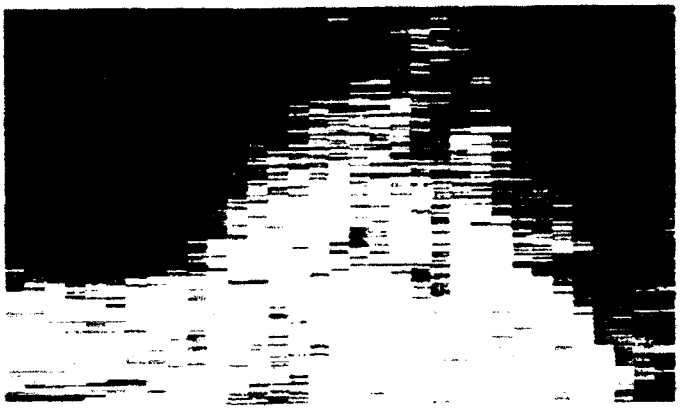


Figure C2. (Sheet 6 of 7)



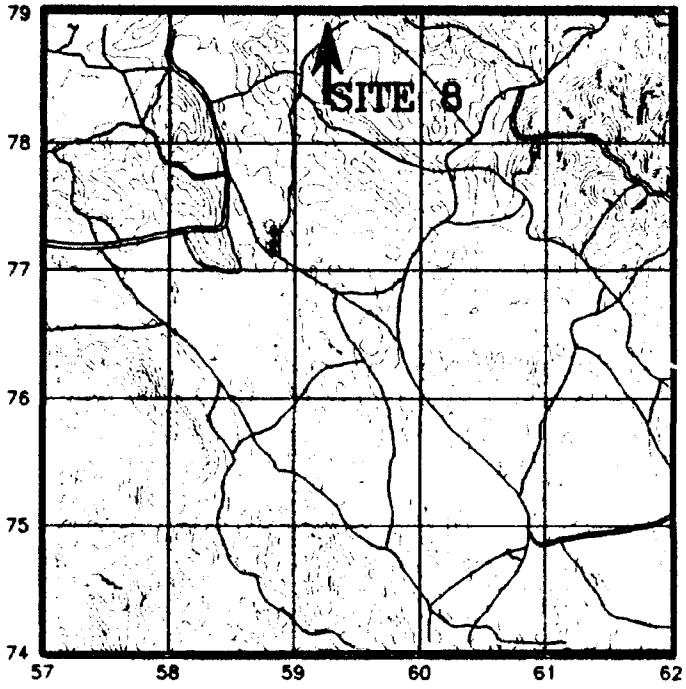
Measured data, log scale

Backscatter predictions, log scale

Terrain contours and vegetation overlay

Figure C2. *(Sheet 7 of 7)*

15 Mar 1988 0713 Test #MS5504



ENVIRONMENTAL DATA

ATMOSPHERIC:

AIR TEMPERATURE	10
RELATIVE HUMIDITY	37
BAROMETRIC PRESSURE	980
SOLAR LOADING	195
OBSERVED CONDITIONS	CLEAR

SCENE

FIELD OF VIEW

AZ	190 4 9
EL	94 54 16
BDA	94.131

THERMAL

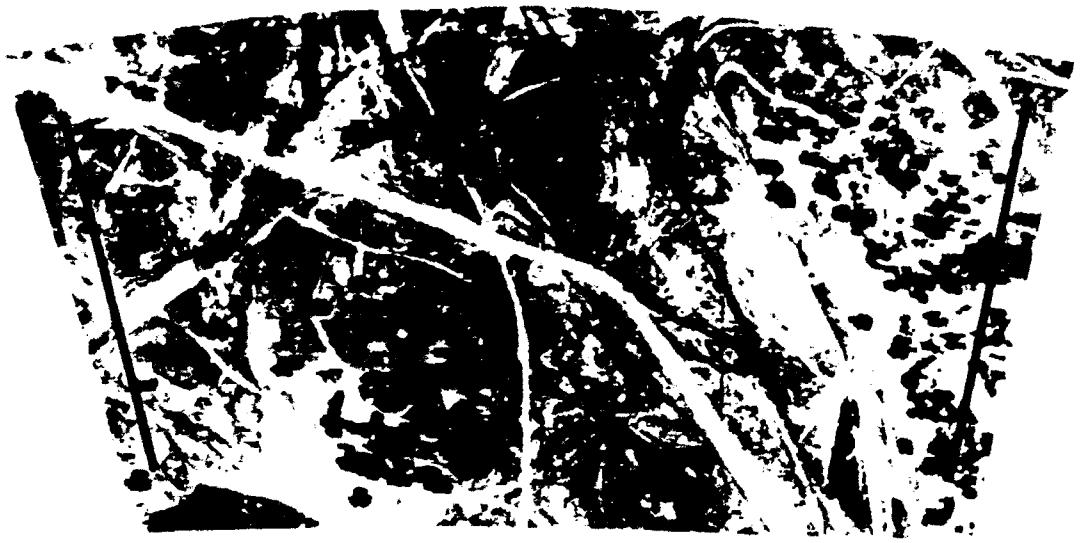
MEAN	288.532
MIN	283.628
MAX	294.872
STD DEV	1.268

VISUAL

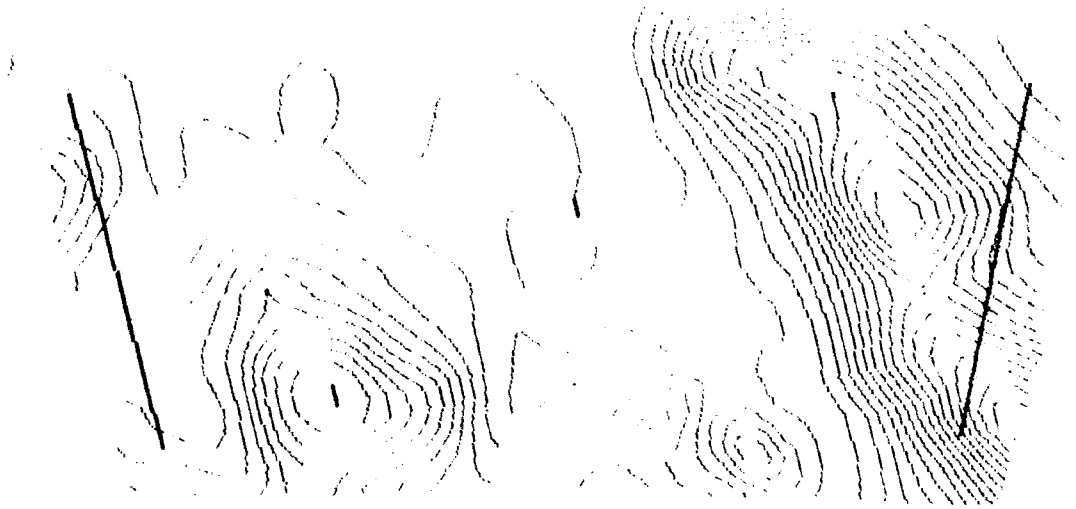
MEAN	1816.75
MIN	589.00
MAX	4047.00
STD DEV	707.10

TARGET	TYPE	RANGE	COORDINATES	AZIMUTH	ELEVATION	ORIEN	REMARKS
1604 ◆	M113	2492	58827714	190 4 21	94 44 38	MOVER	TO 1603
1602 ◆	UH1	2419	58837721	190 2 45	91 51 34	RIGHT SIDE	OPEN
1601 ◆	M60	2336	58847730	190 6 28	94 56 12	REAR	SHADED

Figure C3. Summary data for MS5504 (Sheet 1 of 6)



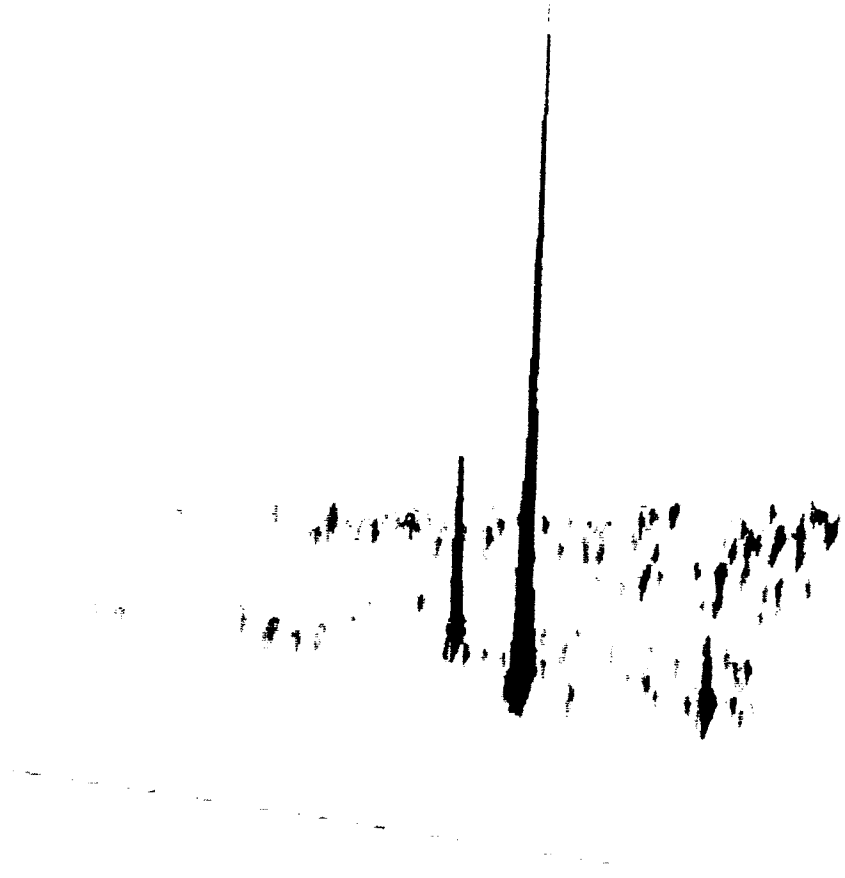
Overhead photo



Terrain contours (10-ft interval)

Figure C3. (Sheet 2 of 6)

Measured data, linear scale



3-D plot of measured data, linear scale

Figure C3. (Sheet 3 of 6)

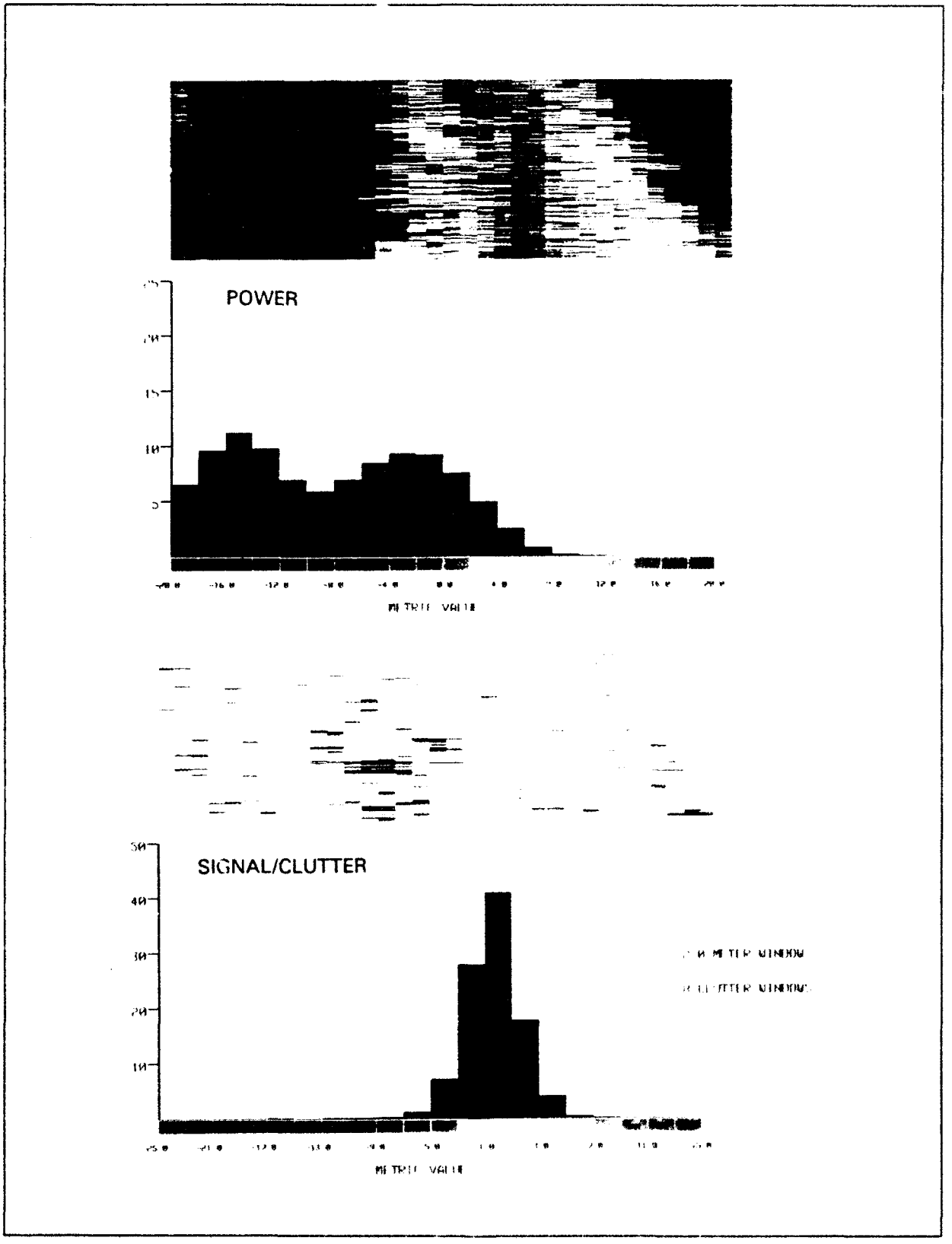


Figure C3. (Sheet 4 of 6)

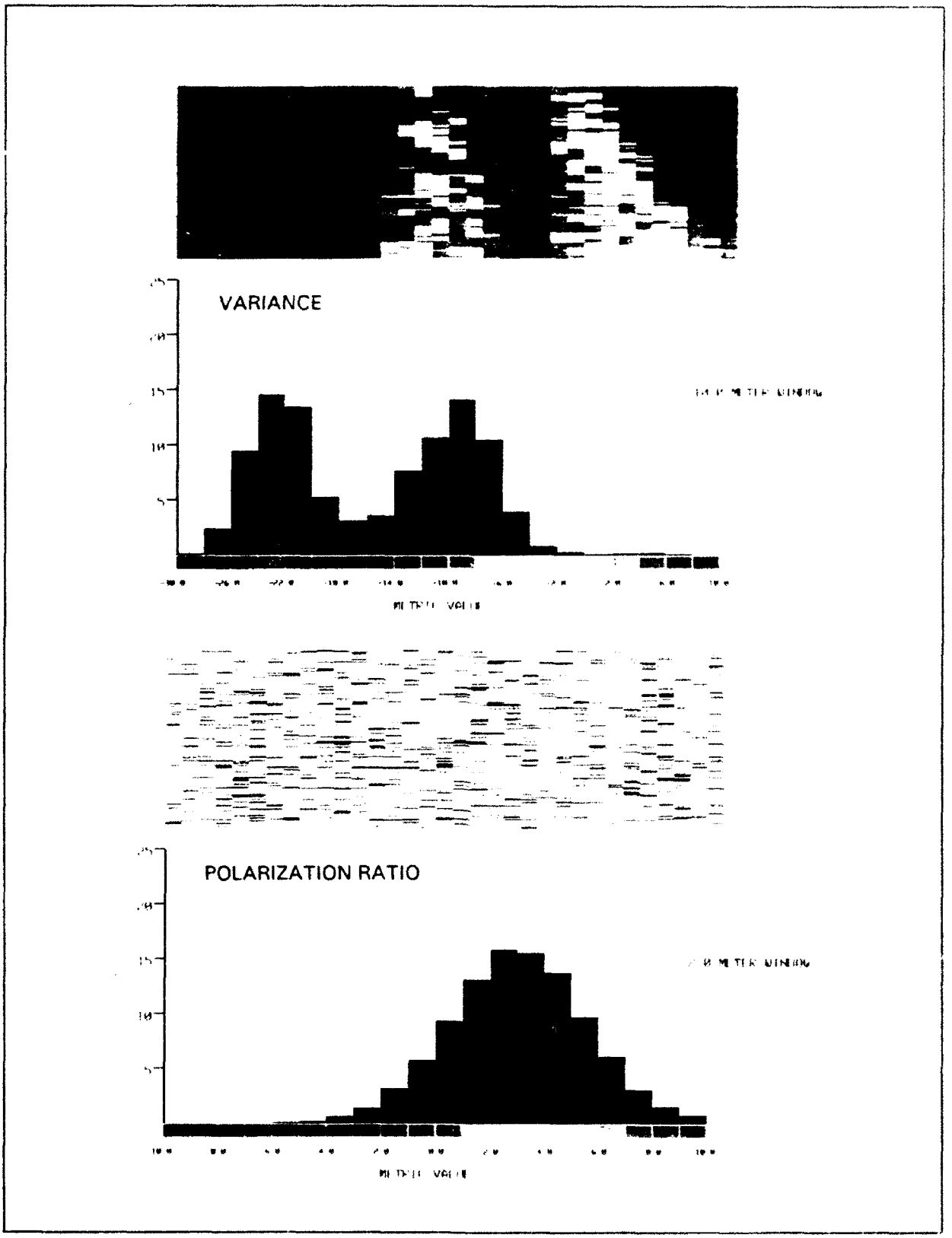
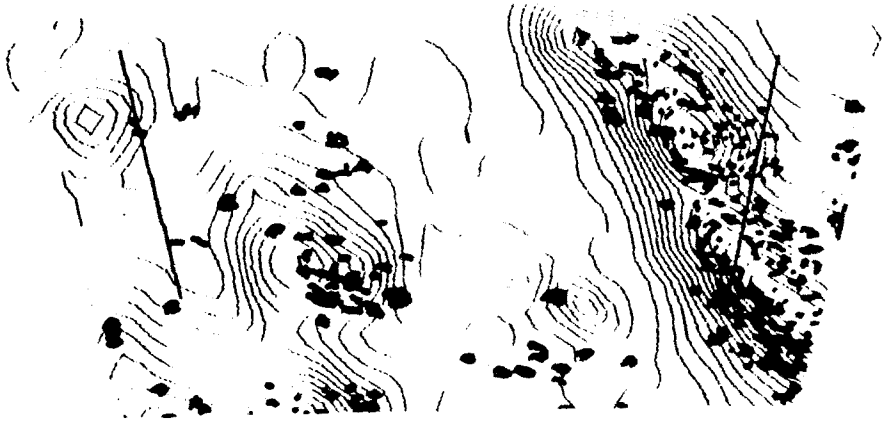


Figure C3. (Sheet 5 of 6)

Measured data, log scale

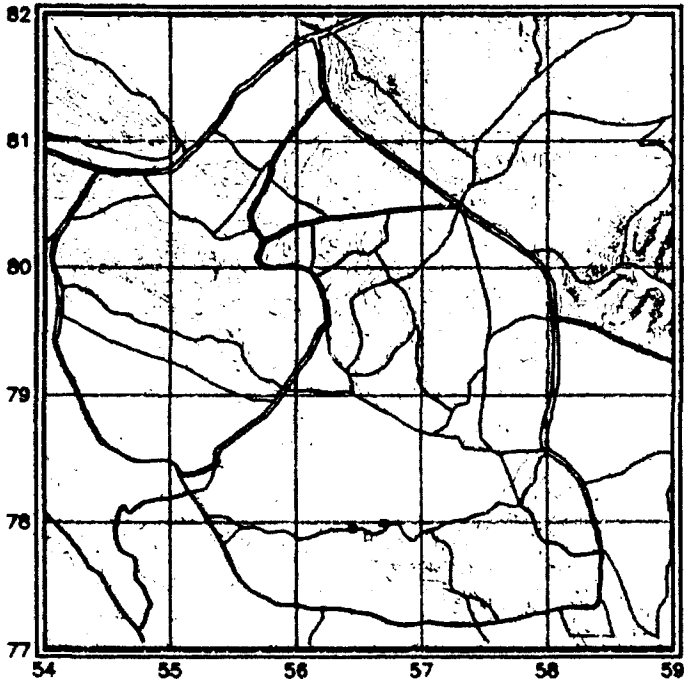
Backscatter predictions, log scale



Terrain contours and vegetation overlay

Figure C3. (Sheet 6 of 6)

15 Mar 1988 0825 Test #MS5601



ENVIRONMENTAL DATA

ATMOSPHERIC:

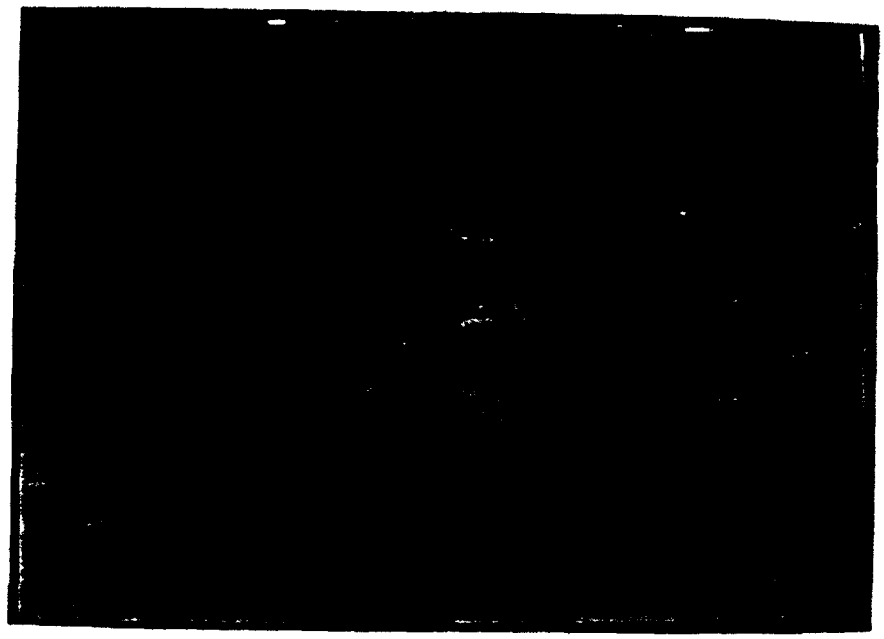
AIR TEMPERATURE (C)	9
RELATIVE HUMIDITY	46
BAROMETRIC PRESSURE	960
SOLAR LOADING	455
OBSERVED CONDITIONS	CLEAR

SCENE:

FIELD OF VIEW		
	AZ	237 51 29
	EL	93 37 50
	BDA	63.611
THERMAL		
	MEAN	279.686
	MIN	276.102
	MAX	284.107
	STD DEV	1.244
VISUAL		
	MEAN	3344.07
	MIN	1137.00
	MAX	7977.00
	STD DEV	932.20

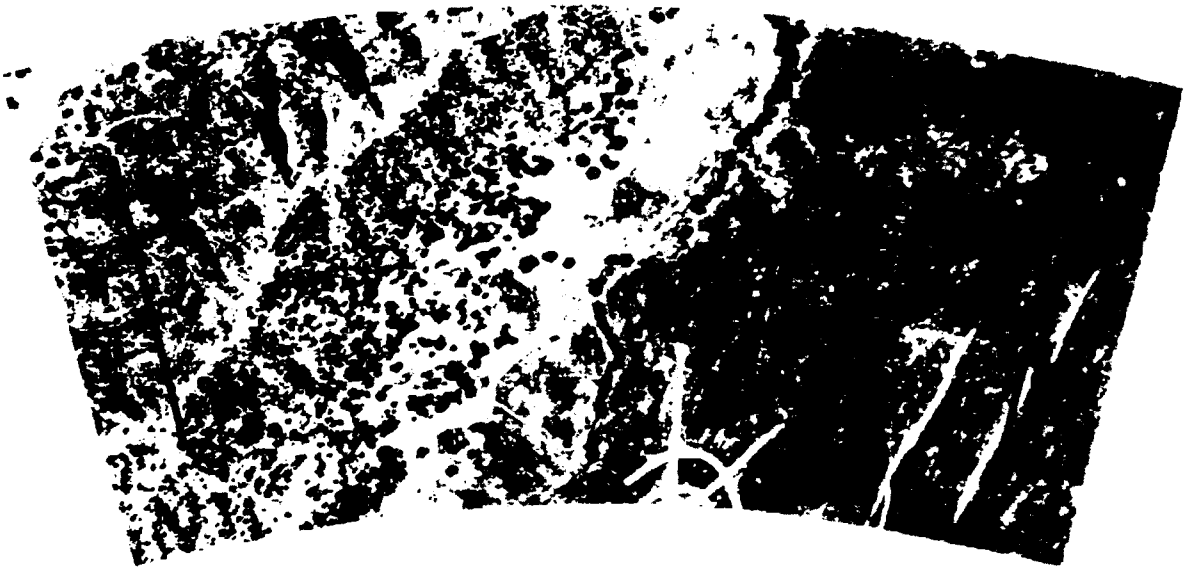
TARGET	TYPE	RANGE	COORDINATES	AZIMUTH	ELEVATION	ORIEN	REMARKS
509	ZSU	3236	56467795	239 39 4	92 26 0	MOVER	TO 0507
509	M113	3236	56467795	239 39 4	92 26 0	MOVER	TO 0507
501	DECOY	3170	56567789	237 35 29	93 29 39	FRONT	OPEN
504	M35	3015	56707600	236 5 46	93 37 50	RIGHT SIDE	OPEN

Figure C4. Summary data for MS5601 (Sheet 1 of 7)

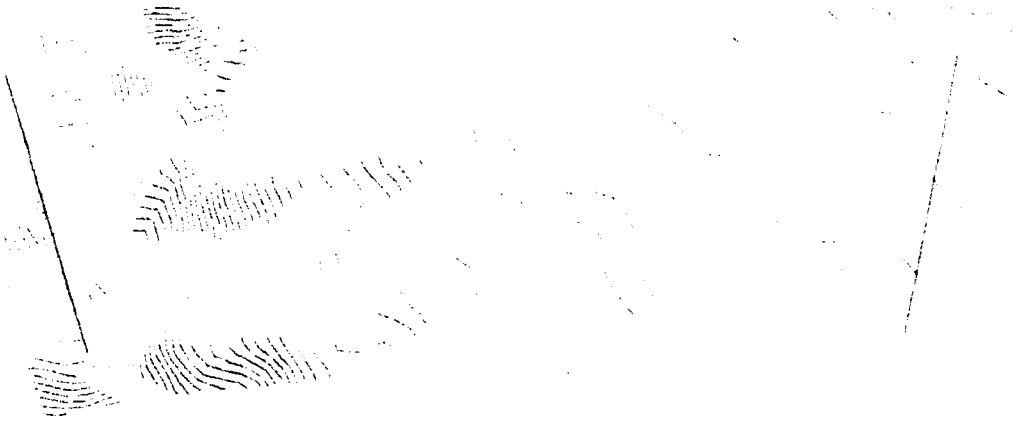


CCD photo

Figure C4. (Sheet 2 of 7)



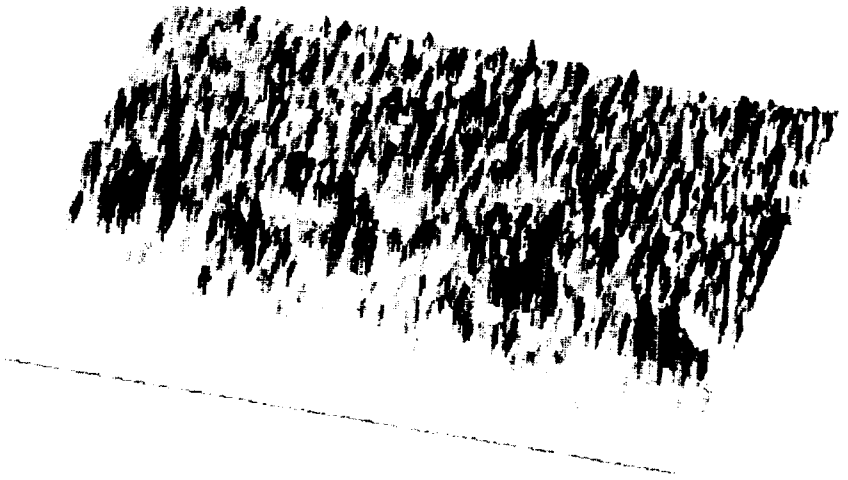
Overhead photo



Terrain contours (10-ft interval)

Figure C4. (Sheet 3 of 7)

Measured data, linear scale



3-D plot of measured data, linear scale

Figure C4. (Sheet 4 of 7)

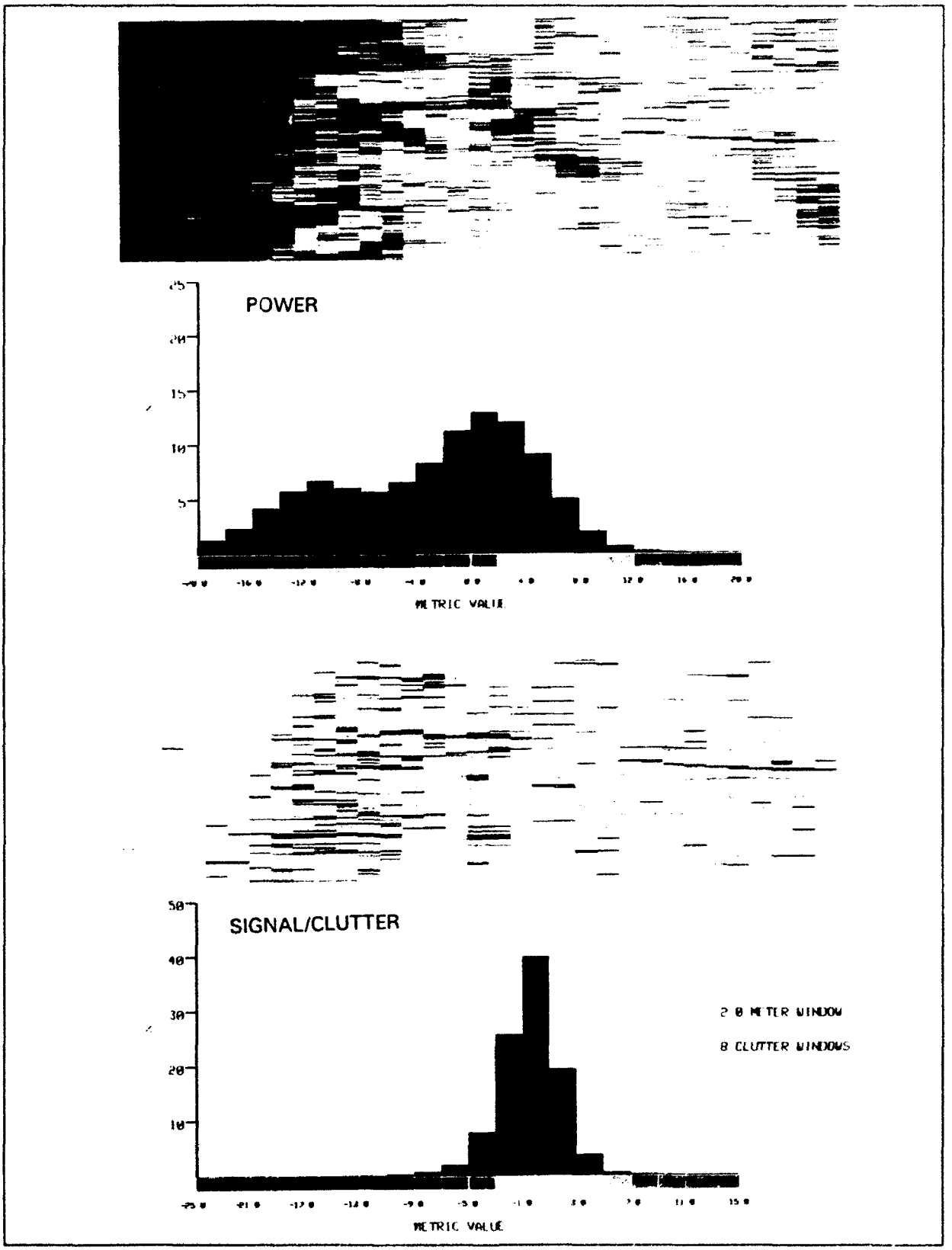


Figure C4. (Sheet 5 of 7)

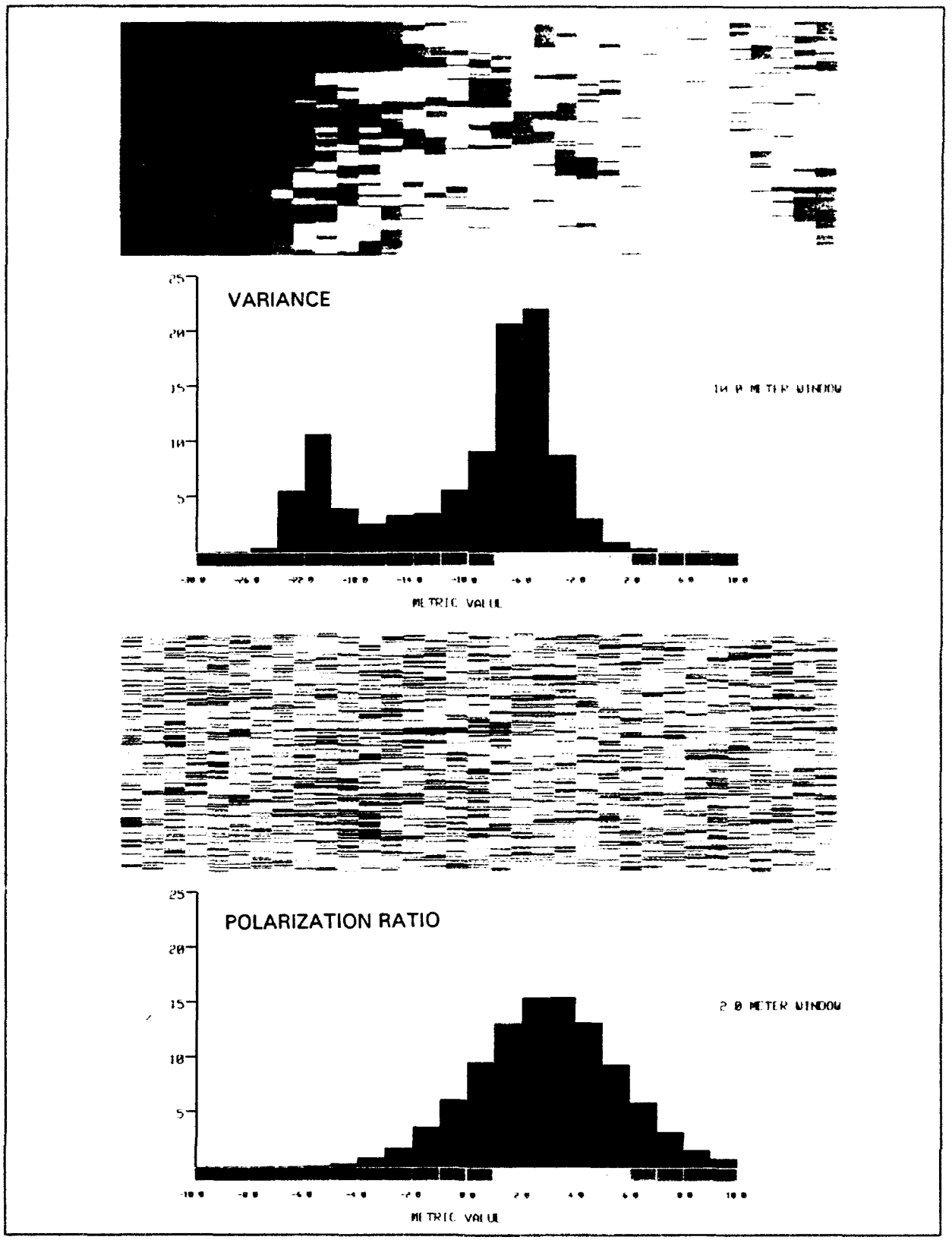


Figure C4. (Sheet 6 of 7)

Measured data, log scale

Backscatter predictions, log scale

Terrain contours and vegetation overlay

Figure C4. (Sheet 7 of 7)

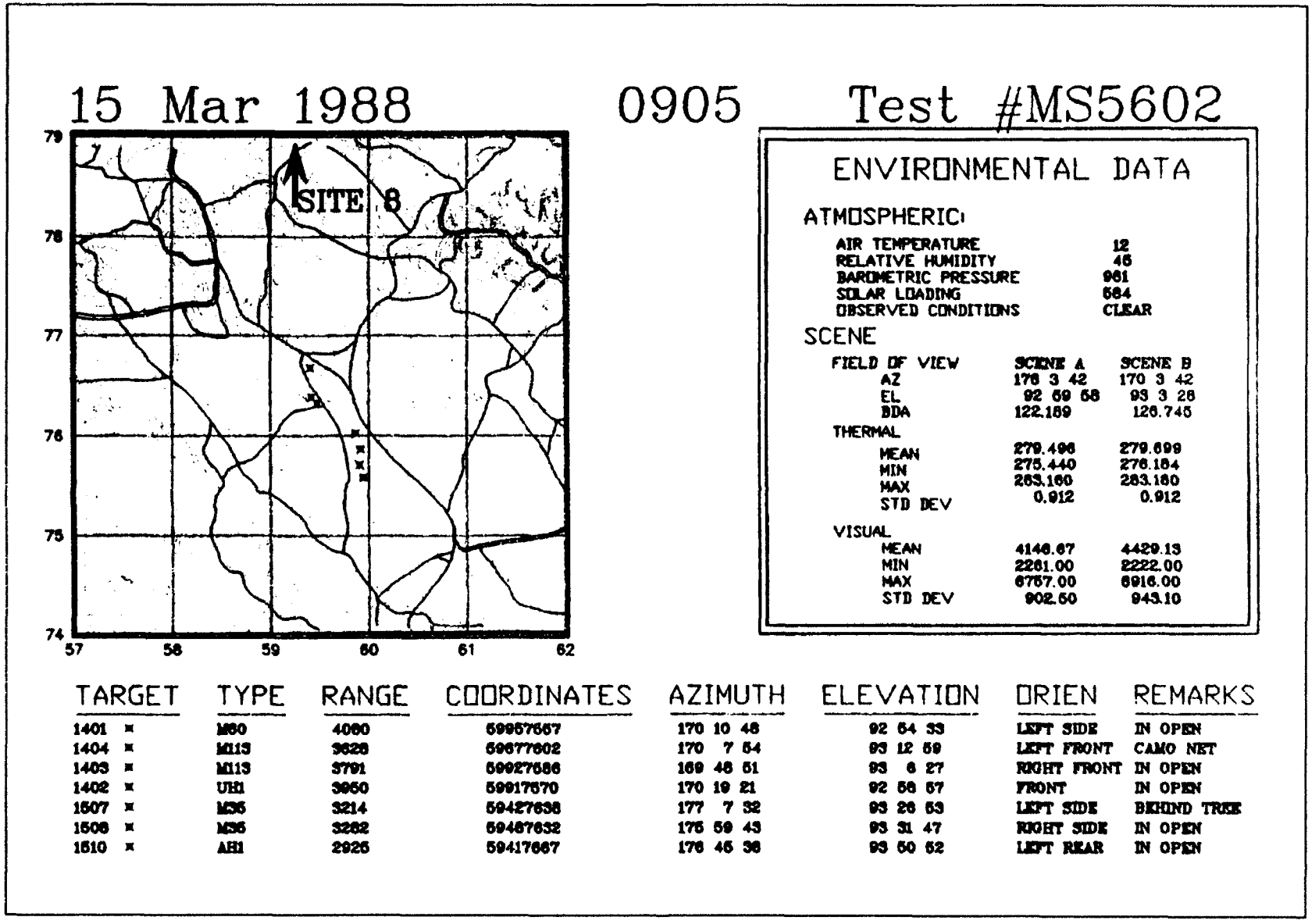
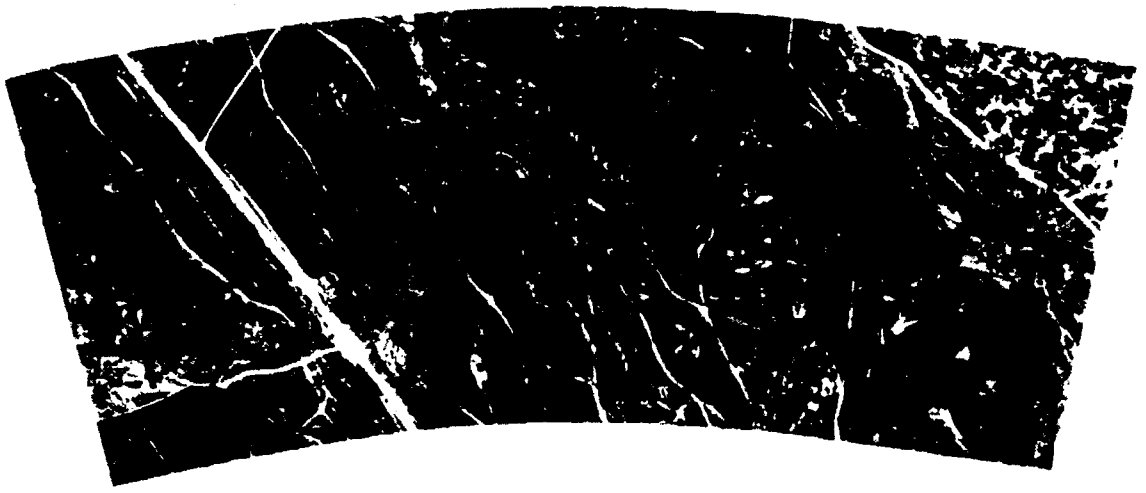


Figure C5. Summary data for MS5602 (Sheet 1 of 7)

CCD photo

Figure C5. (Sheet 2 of 7)

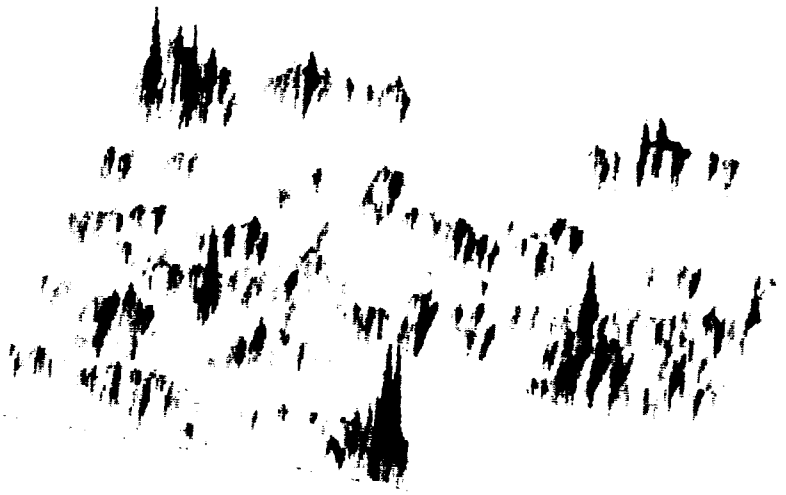


Overhead photo

Terrain contours (10-ft interval)

Figure C5. (Sheet 3 of 7)

Measured data, linear scale



3-D plot of measured data, linear scale

Figure C5. (Sheet 4 of 7)

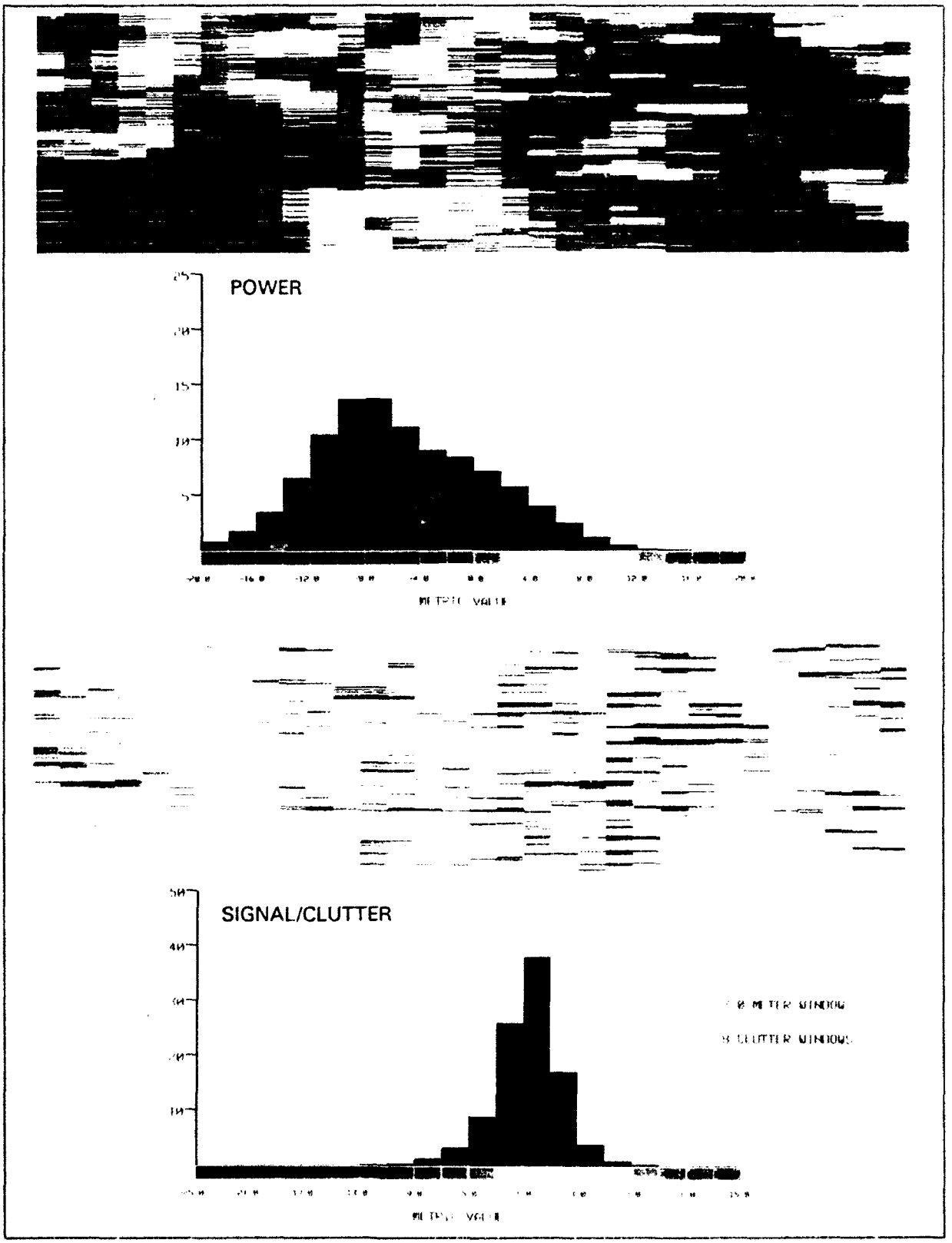


Figure C5. (Sheet 5 of 7)

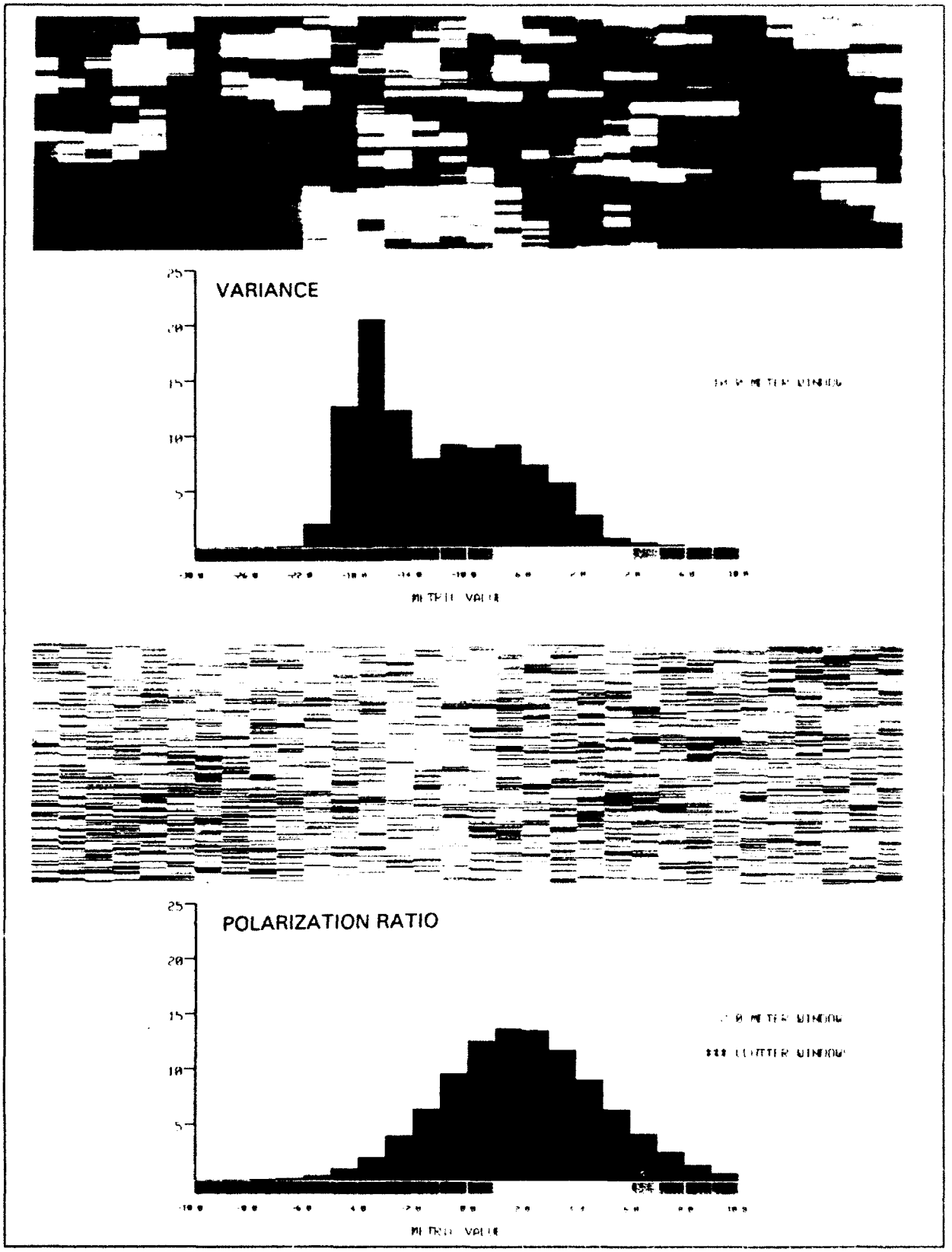


Figure C5. (Sheet 6 of 7)

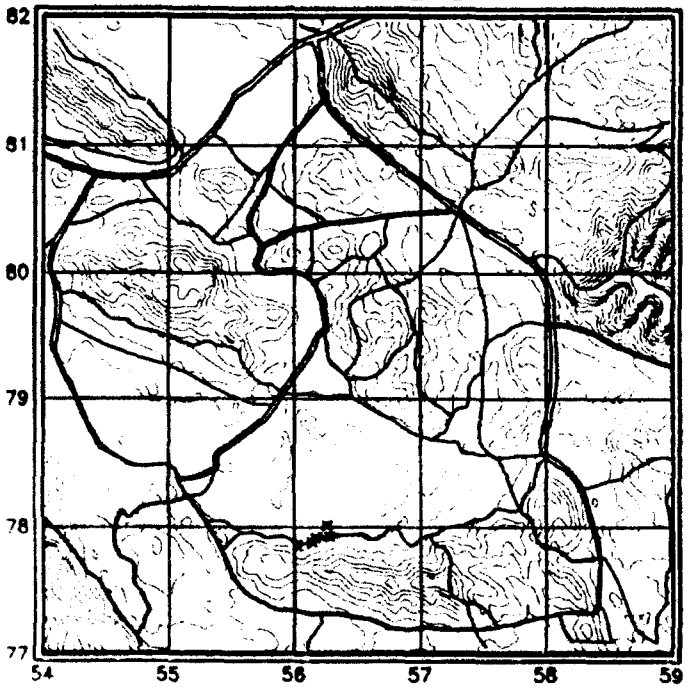
Measured data, log scale

Backscatter predictions, log scale

Terrain contours and vegetation overlay

Figure C5. (Sheet 7 of 7)

15 Mar 1988 0945 Test #MS5603



ENVIRONMENTAL DATA

ATMOSPHERIC:

AIR TEMPERATURE (C)	14
RELATIVE HUMIDITY	44
BAROMETRIC PRESSURE	960
SOLAR LOADING	678
OBSERVED CONDITIONS	CLEAR

SCENE:

FIELD OF VIEW	
AZ	241 41 27
EL	93 15 23
BDA	78.600
THERMAL	
MEAN	283.013
MIN	279.848
MAX	286.272
STD DEV	1.345
VISUAL	
MEAN	3662.26
MIN	1296.00
MAX	5664.00
STD DEV	1023.00

TARGET	TYPE	RANGE	COORDINATES	AZIMUTH	ELEVATION	ORIEN	REMARKS
401 -	ZSU	3660	56027787	242 0 26	93 9 53	LEFT SIDE	OPEN
404 *	M35	3550	56147789	241 16 36	93 7 55	FRONT	BEHIND TREE
405 *	M35	3511	56177792	241 43 13	93 14 40	REAR	OPEN
408 *	M113	3409	56287793	240 51 41	93 17 38	FRONT	OPEN
407 *	AH1	3364			93 21 21	LEFT FRONT	OPEN

Figure C6. Summary data for MS5603 (Sheet 1 of 7)

CCD photo

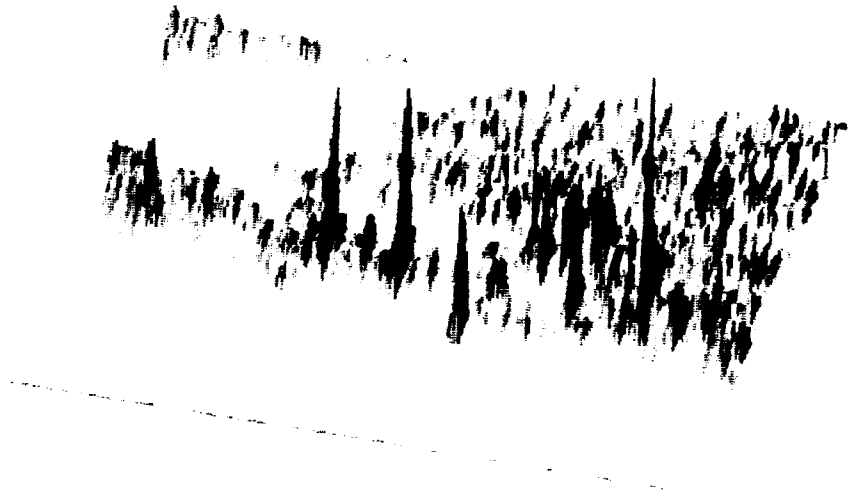
Figure C6. (Sheet 2 of 7)

Overhead photo

Terrain contours (10-ft interval)

Figure C6. (Sheet 3 of 7)

Measured data, linear scale



3-D plot of measured data, linear scale

Figure C6. (Sheet 4 of 7)

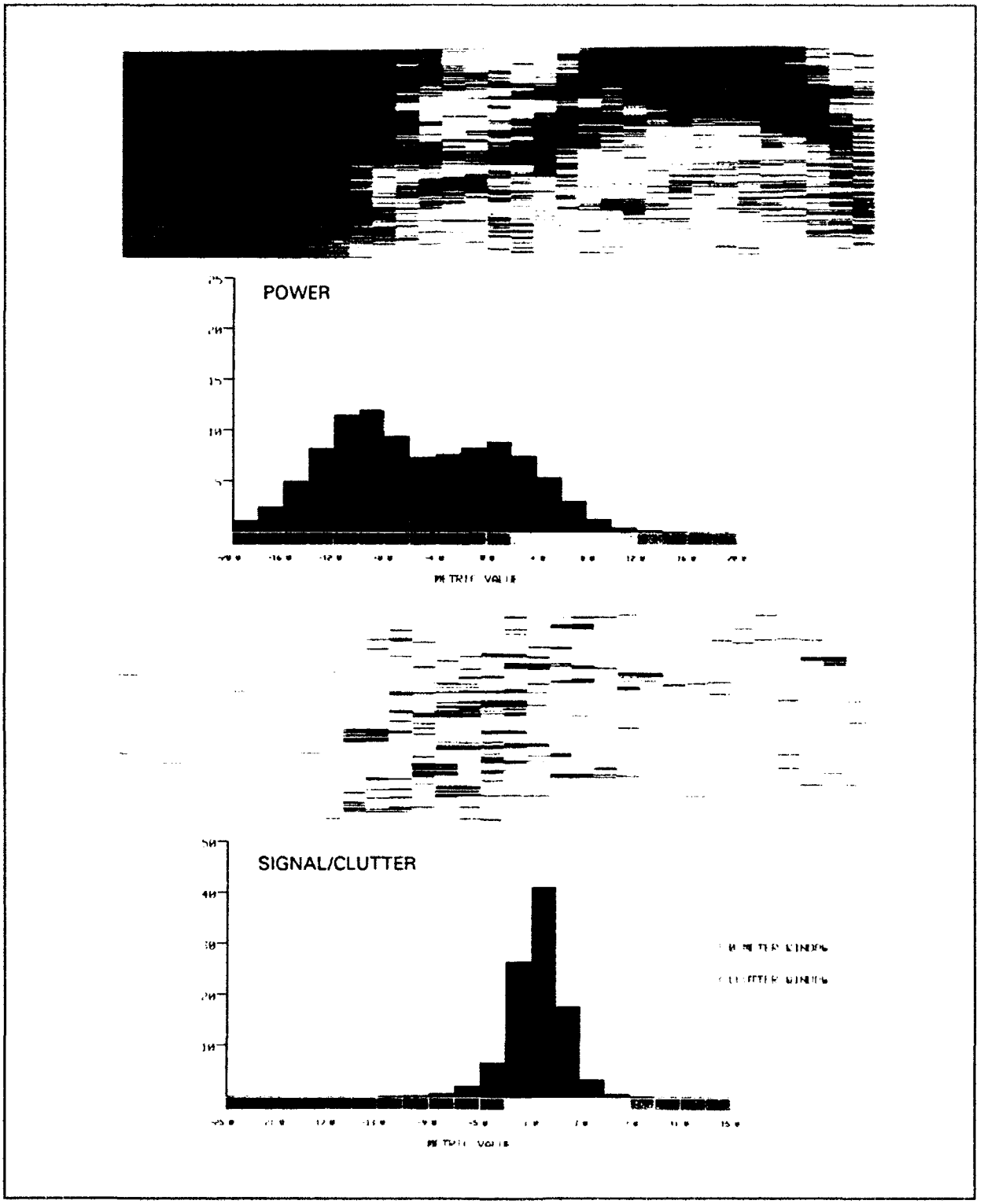


Figure C6. (Sheet 5 of 7)

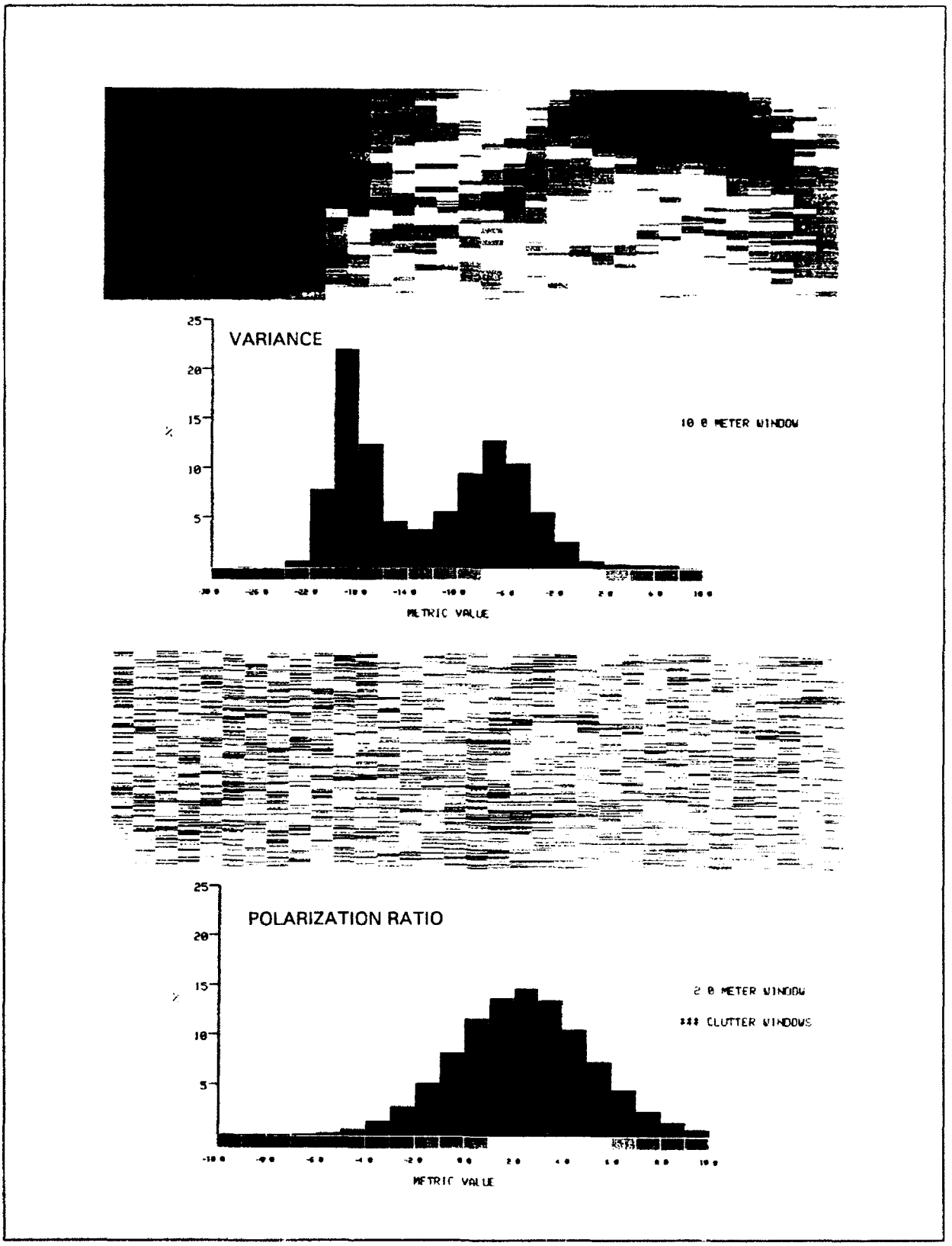
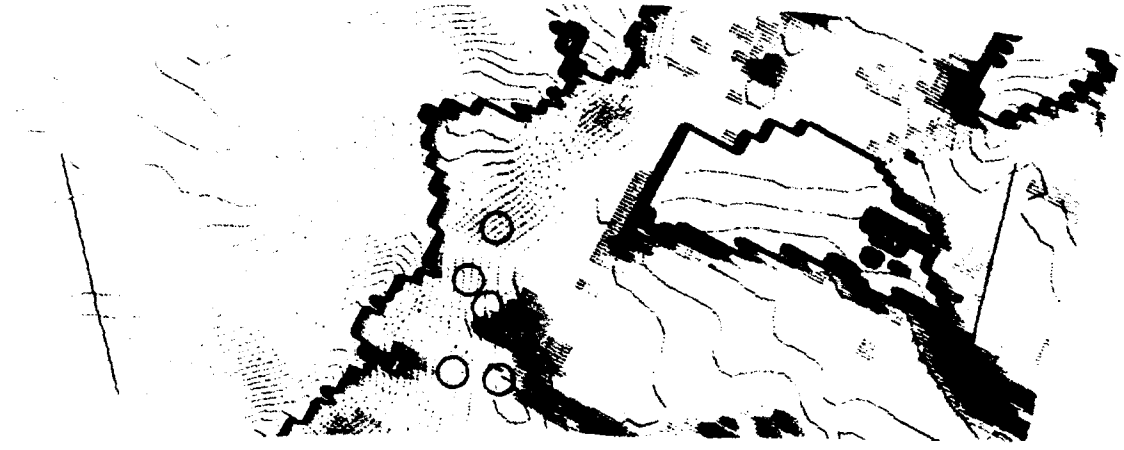


Figure C6. (Sheet 6 of 7)

Measured data, log scale

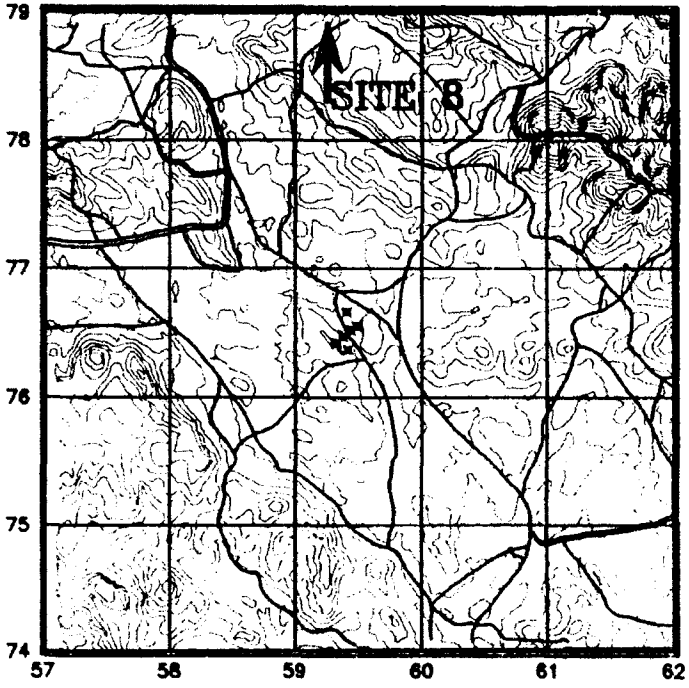


Backscatter predictions, log scale

Terrain contours and vegetation overlay

Figure C6. (Sheet 7 of 7)

15 Mar 1988 1025 Test #MS5604



ENVIRONMENTAL DATA

ATMOSPHERIC:

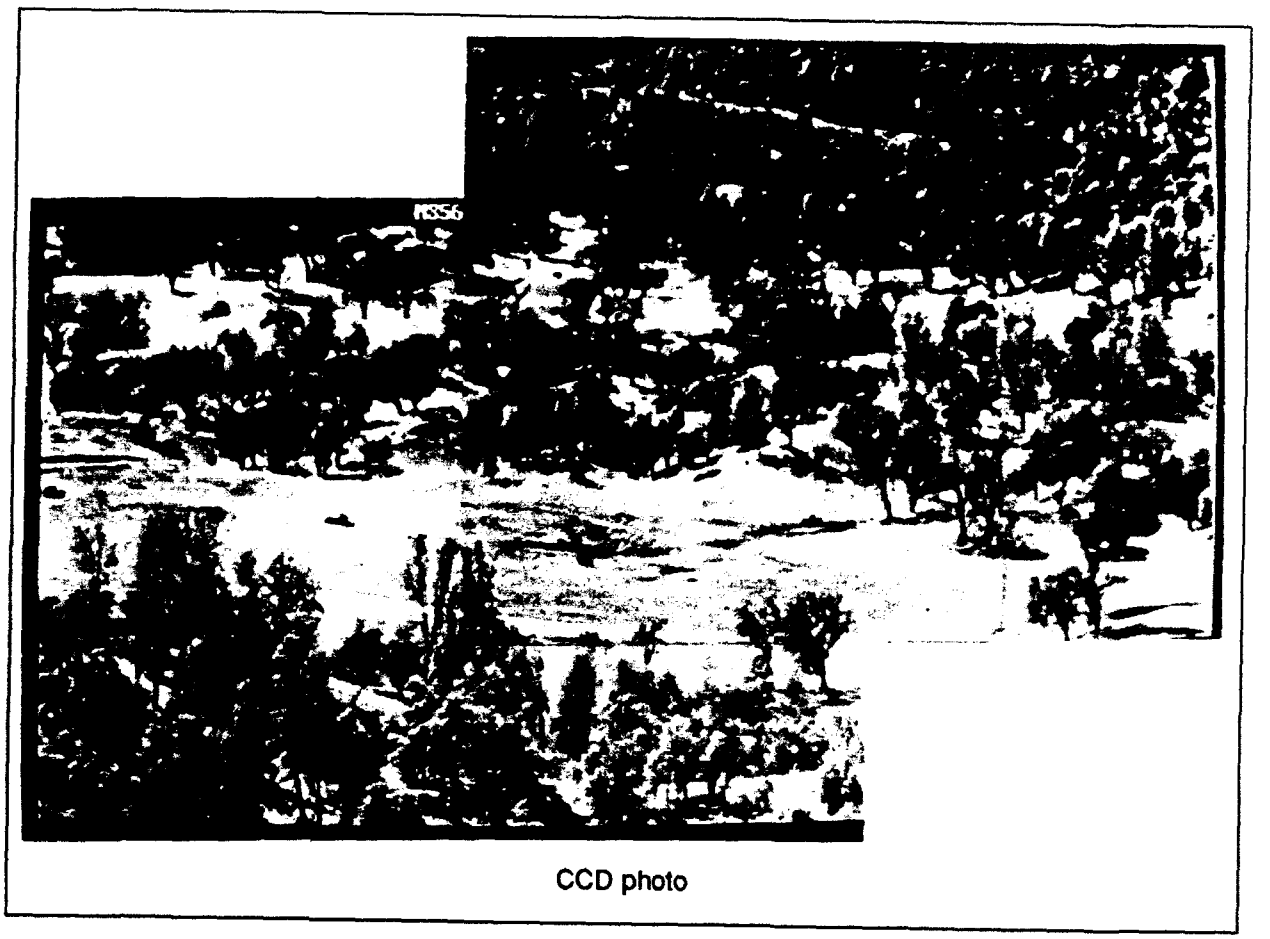
AIR TEMPERATURE	15
RELATIVE HUMIDITY	33
BAROMETRIC PRESSURE	960
SOLAR LOADING	788
OBSERVED CONDITIONS	CLEAR

SCENE

FIELD OF VIEW	SCENE A	SCENE B
AZ	177 35 16	176 1 14
EL	92 59 59	93 46 26
BDA	128.505	129.914
THERMAL		
MEAN	284.805	286.089
MIN	280.510	279.917
MAX	289.506	289.866
STD DEV	1.091	1.307
VISUAL		
MEAN	4276.87	4410.12
MIN	2330.00	2226.00
MAX	7427.00	8043.00
STD DEV	971.80	1056.00

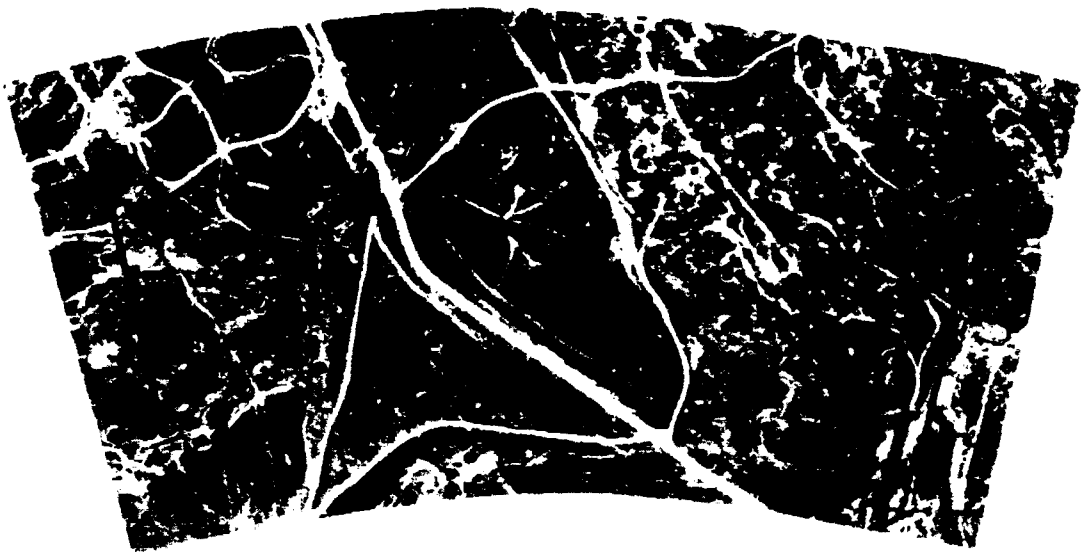
TARGET	TYPE	RANGE	COORDINATES	AZIMUTH	ELEVATION	ORIEN	REMARKS
1502 *	M60	3065	59447653	176 33 10	93 49 11	RIGHT SIDE	OPEN
1503 *	M60	3041	59497656	175 28 32	93 43 21	RIGHT SIDE	OPEN
1504 *	M113	3112	59367648	177 39 16	93 44 9	RIGHT SIDE	OPEN
1505 *	M113	3163	59337643	178 38 20	93 25 31	LEFT SIDE	BEHIND TREES
1507 *	M35	3214	59427638	177 4 36	93 27 35	FRONT	SHADED
1510 *	AH1	2925	59417667	176 35 51	93 52 46	LEFT REAR	OPEN

Figure C7. Summary data for MS5604 (Sheet 1 of 7)

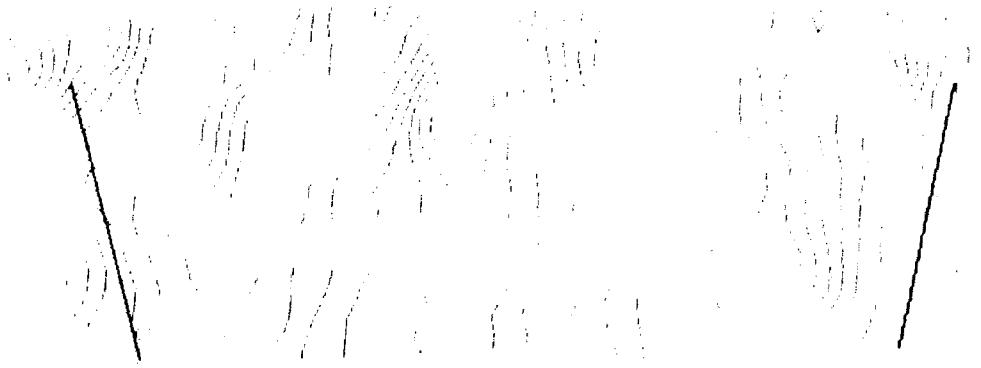


CCD photo

Figure C7. (Sheet 2 of 7)

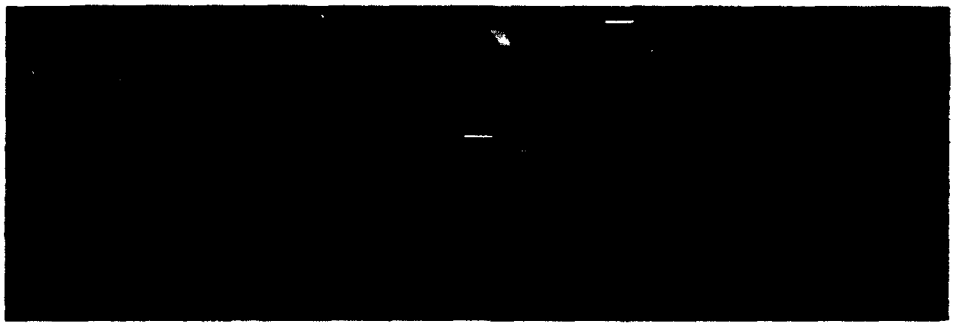


Overhead photo

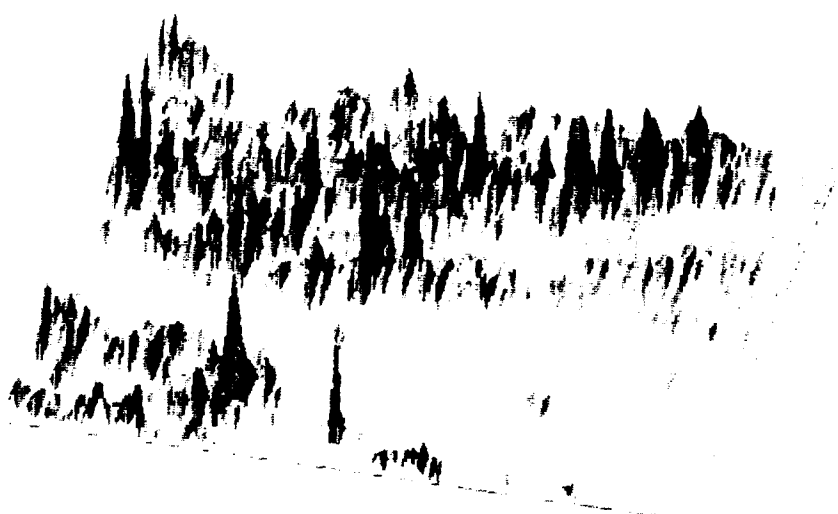


Terrain contours (10-ft interval)

Figure C7. (Sheet 3 of 7)



Measured data, linear scale



3-D plot of measured data, linear scale

Figure C7. (Sheet 4 of 7)

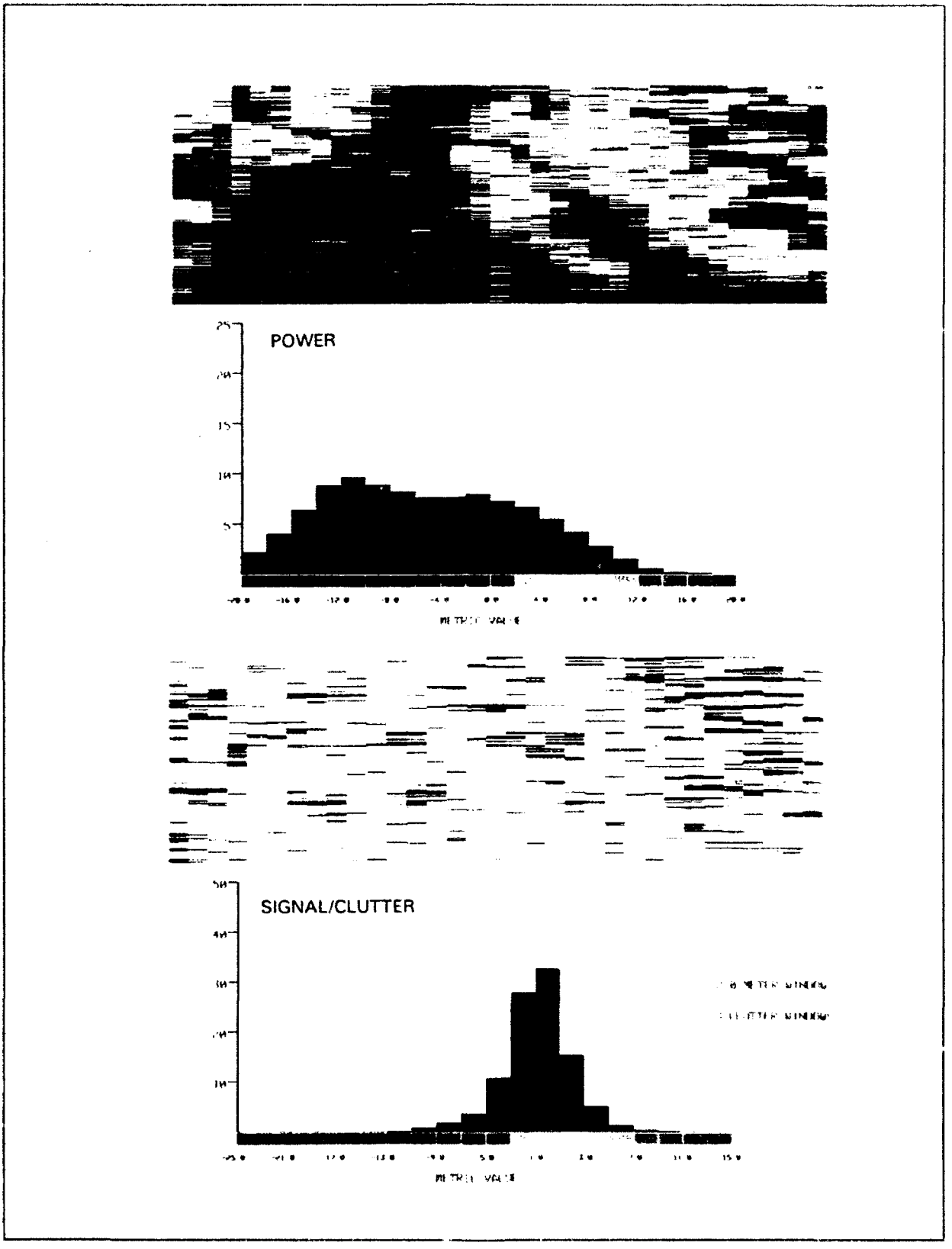


Figure C7. (Sheet 5 of 7)

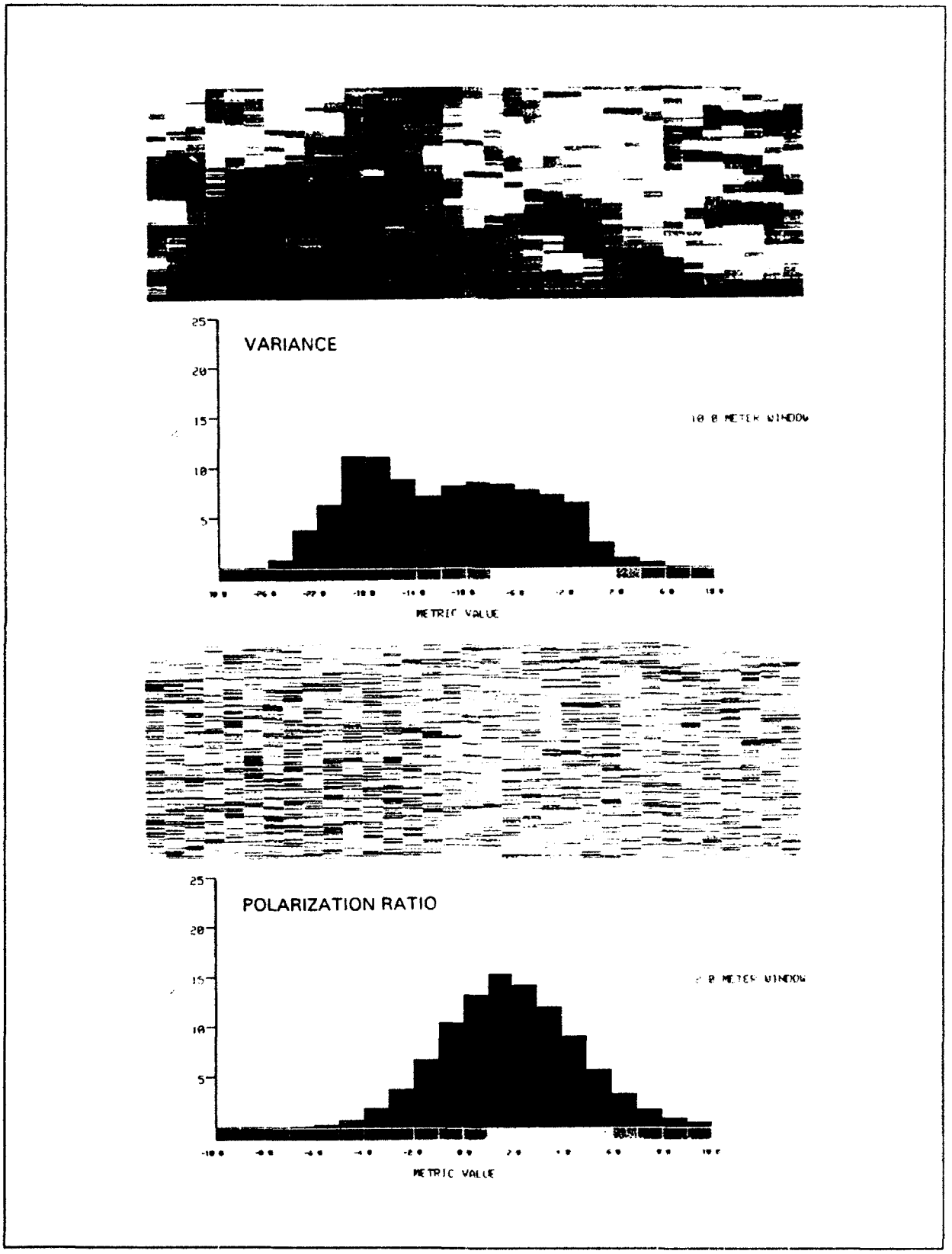
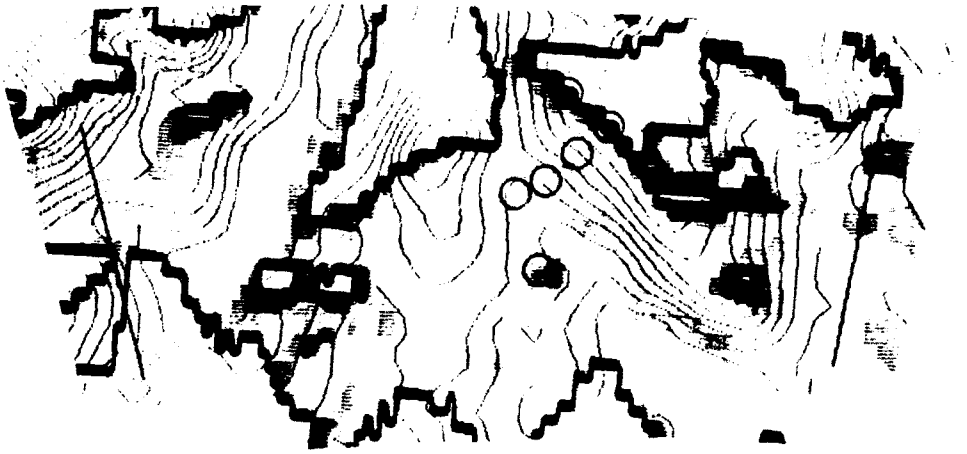
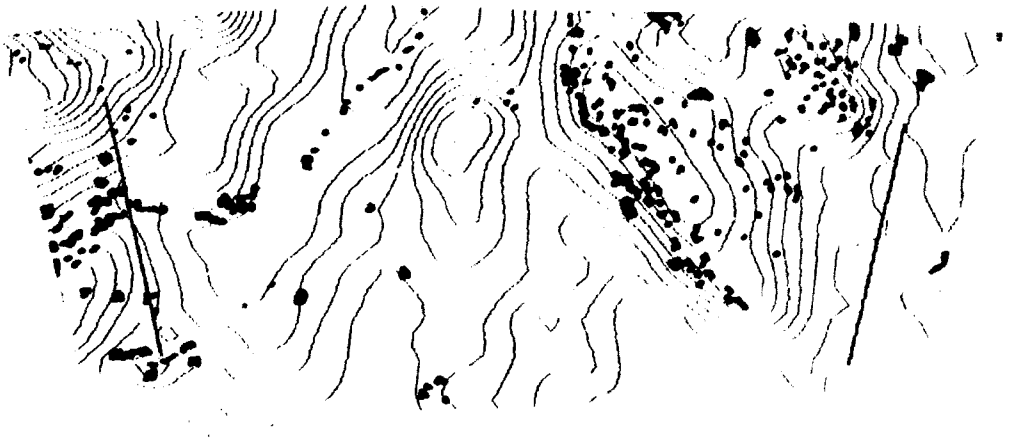


Figure C7. (Sheet 6 of 7)

Measured data, log scale



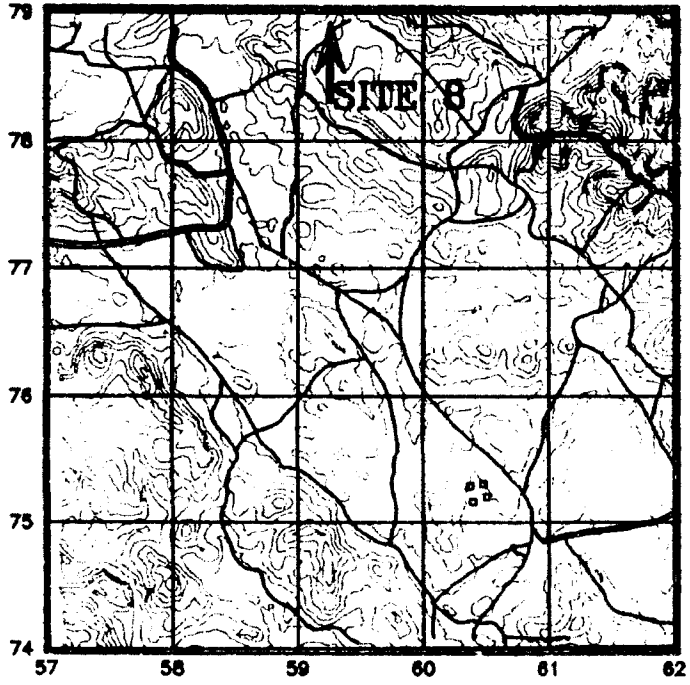
Backscatter predictions, log scale



Terrain contours and vegetation overlay

Figure C7. (Sheet 7 of 7)

16 Mar 1988 0540 Test #MS5702



ENVIRONMENTAL DATA

ATMOSPHERIC

AIR TEMPERATURE	14
RELATIVE HUMIDITY	99
BAROMETRIC PRESSURE	983
SOLAR LOADING	0
OBSERVED CONDITIONS	HEAVY FOG

SCENE

FIELD OF VIEW

AZ	164 51 6
EL	92 41 30
BDA	109.934

THERMAL

MEAN	277.180
MIN	277.191
MAX	277.191
STD DEV	0.000

VISUAL

MEAN	0.00
MIN	0.00
MAX	0.00
STD DEV	0.00

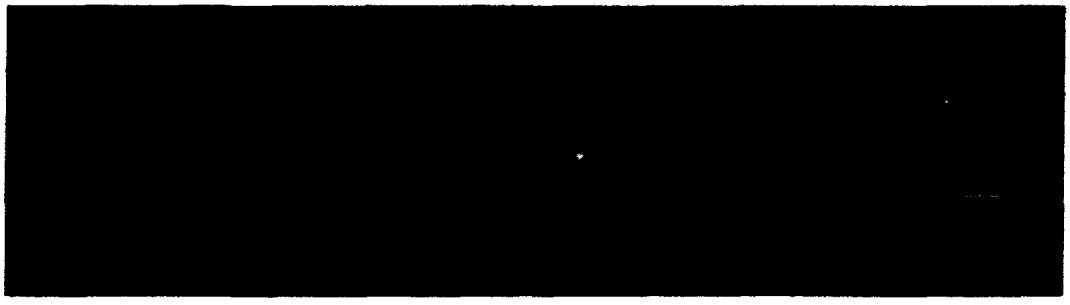
TARGET	TYPE	RANGE	COORDINATES	AZIMUTH	ELEVATION	ORIEN	REMARKS
1301 ▫	M60	4456	60377628	165 23 49	92 43 11	LEFT FRONT	
1302 ▫	M60	4456	60477630	164 8 39	92 43 20	LEFT REAR	
1303 ▫	M35	4574	60397618	165 36 6	92 42 45	RIGHT FRONT	
1304 ▫	M113	4570	60507620	164 6 7	92 39 41	RIGHT FRONT	

Figure C8. Summary data for MS5702 (Sheet 1 of 6)

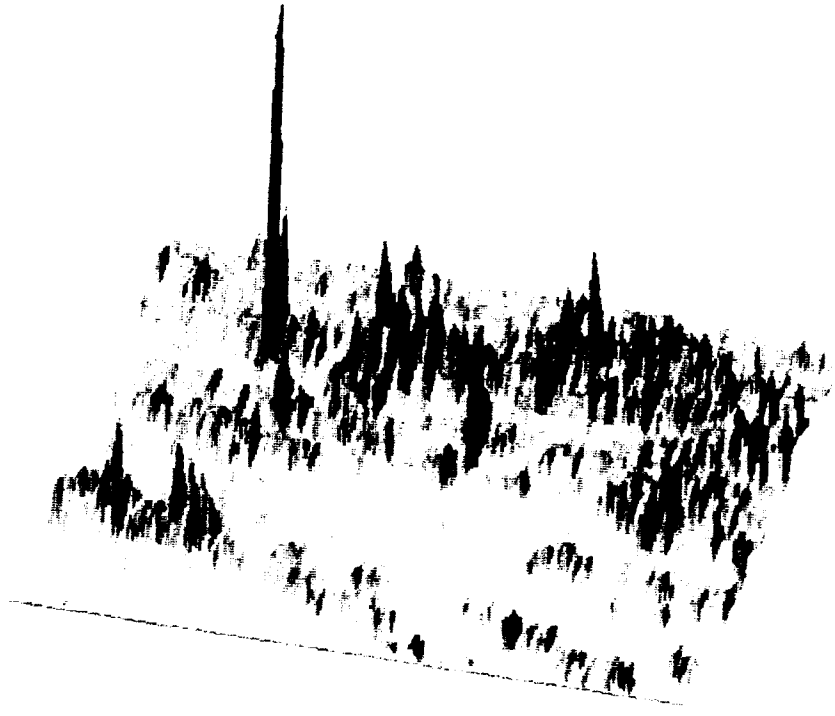
Overhead photo

Terrain contours (10-ft interval)

Figure C8. (Sheet 2 of 6)



Measured data, linear scale



3-D plot of measured data, linear scale

Figure C8. (Sheet 3 of 6)

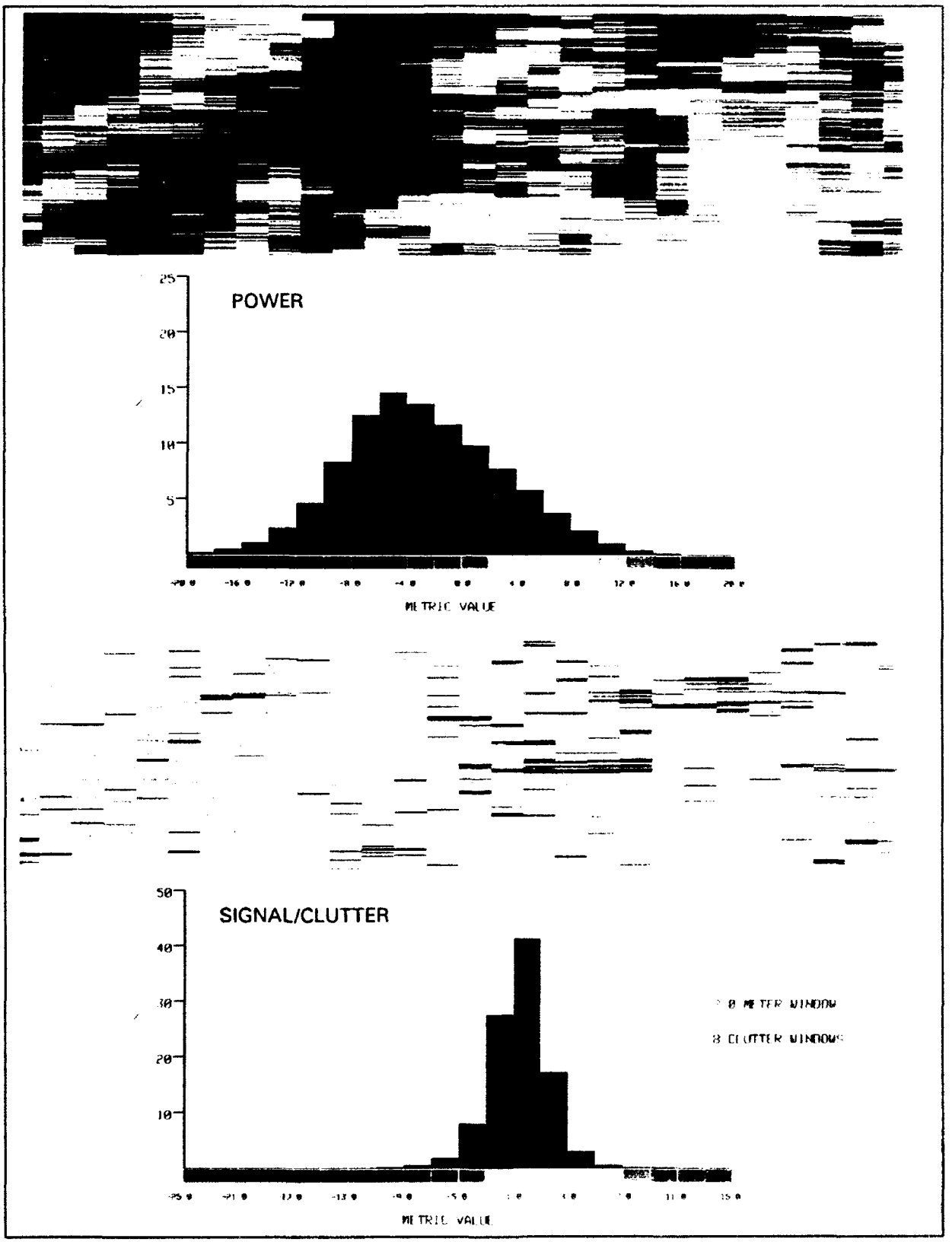


Figure C8. (Sheet 4 of 6)

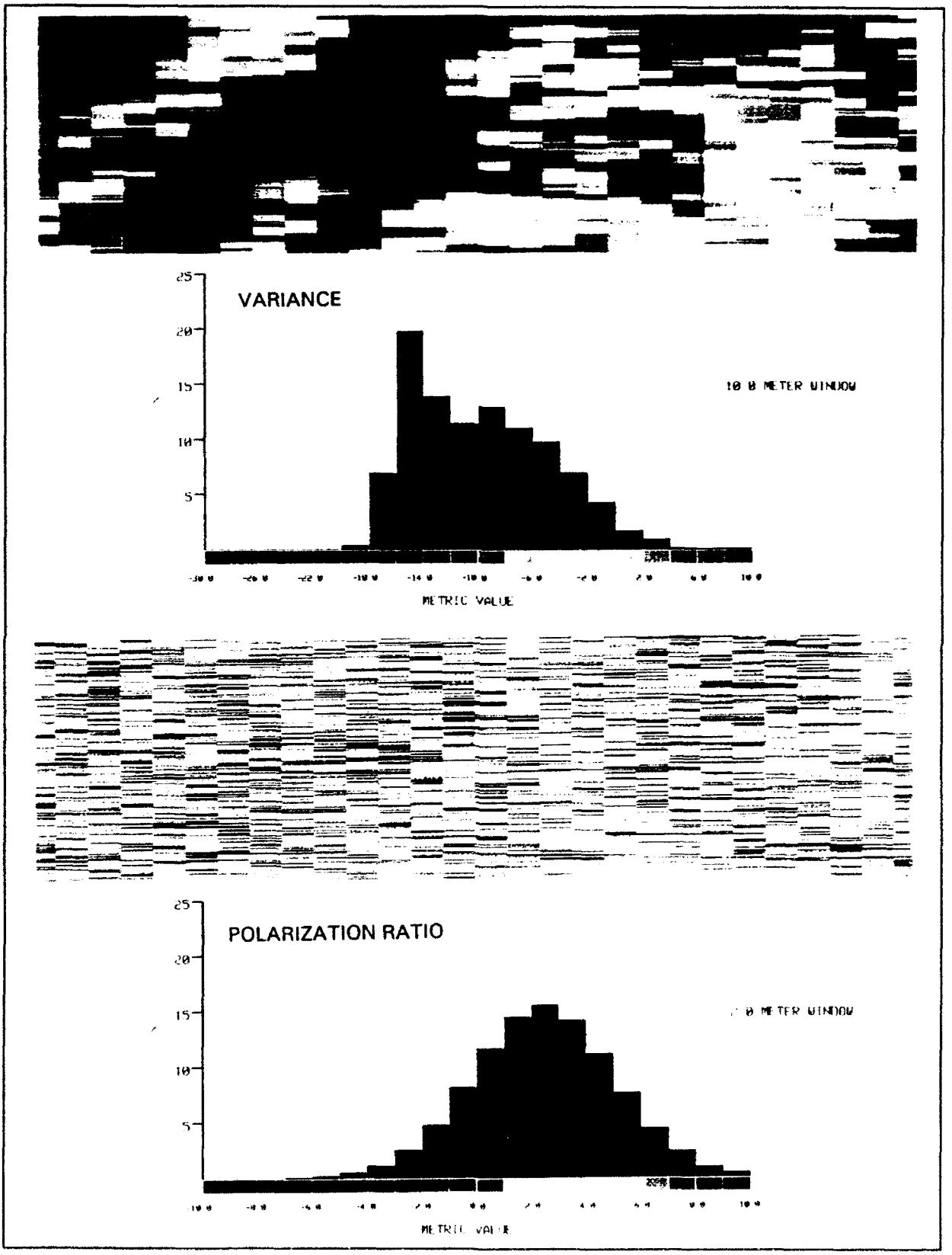
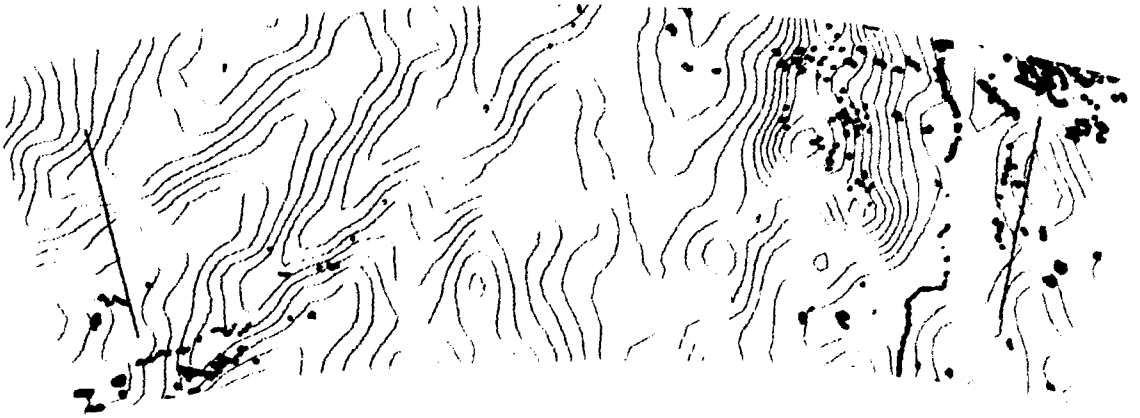


Figure C8. (Sheet 5 of 6)

Measured data, log scale

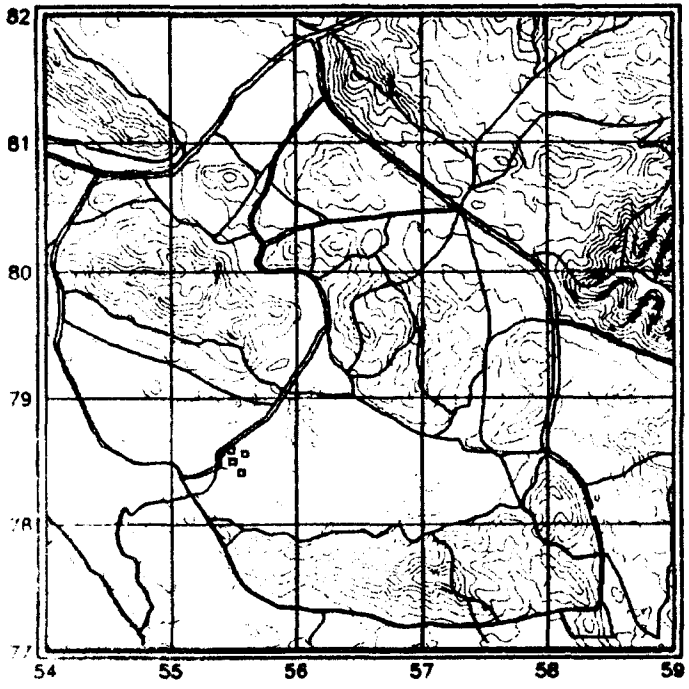
Backscatter predictions, log scale



Terrain contours and vegetation overlay

Figure C8. (Sheet 6 of 6)

16 Mar 1988 0620 Test #MS5703



• SITE 8

ENVIRONMENTAL DATA

ATMOSPHERIC:

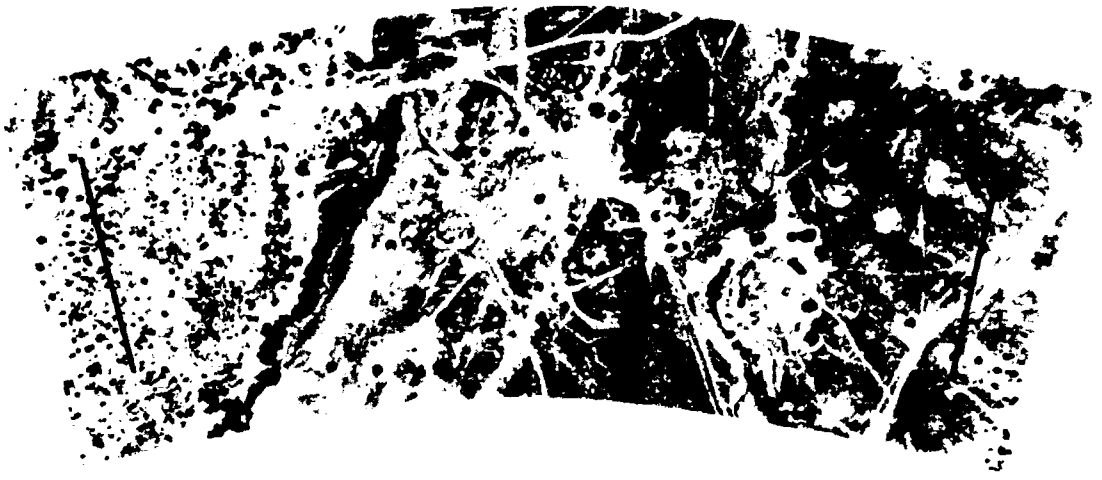
AIR TEMPERATURE (C)	12
RELATIVE HUMIDITY	99
BAROMETRIC PRESSURE	983
SOLAR LOADING	23
OBSERVED CONDITIONS	HEAVY FOG

SCENE:

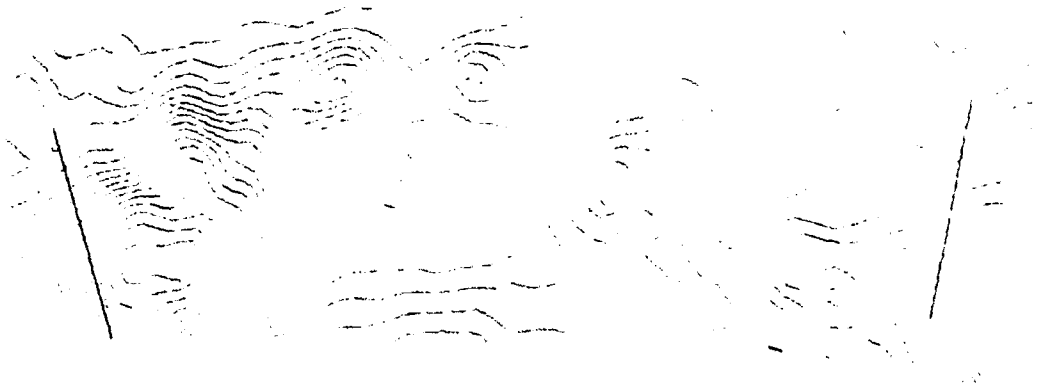
FIELD OF VIEW	
AZ	254 10 34
EL	92 5 59
BDA	21.258
THERMAL	
MEAN	289.077
MIN	289.066
MAX	289.066
STD DEV	0.000
VISUAL	
MEAN	0.00
MIN	0.00
MAX	0.00
STD DEV	0.00

TARGET	TYPE	RANGE	COORDINATES	AZIMUTH	ELEVATION	ORIEN	REMARKS
301	DECOY	3609	55597856	254 20 15	92 59 0		
303	M35	3919	55497850	253 51 40	92 46 4	FRONT	
304	M60	3860	55567841	252 23 42	92 59 59	LEFT FRONT	
306	M60	3909	55457859	255 10 34	92 54 34	RIGHT FRONT	
307	M113	3991	55407857	255 9 38	92 47 4	RIGHT FRONT	

Figure C9. Summary data for MS5703 (Sheet 1 of 6)



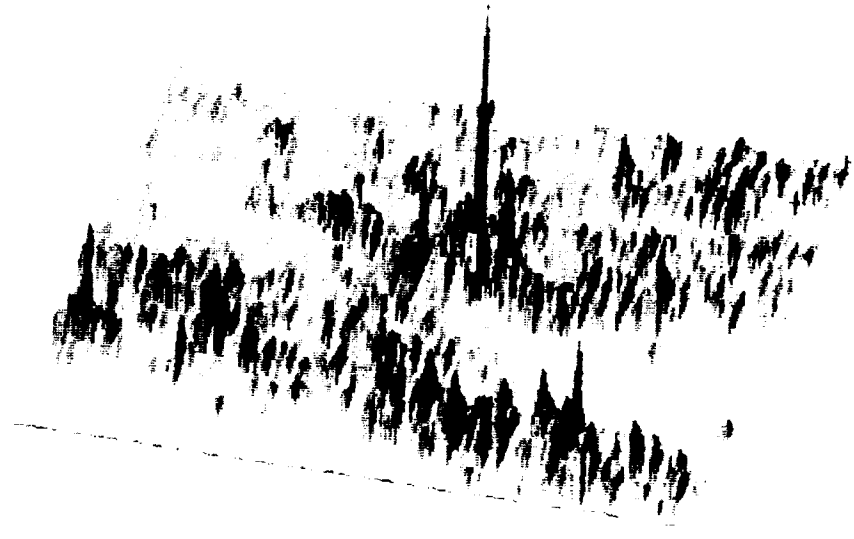
Overhead photo



Terrain contours (10-ft interval)

Figure C9. (Sheet 2 of 6)

Measured data, linear scale



3-D plot of measured data, linear scale

Figure C9. (Sheet 3 of 6)

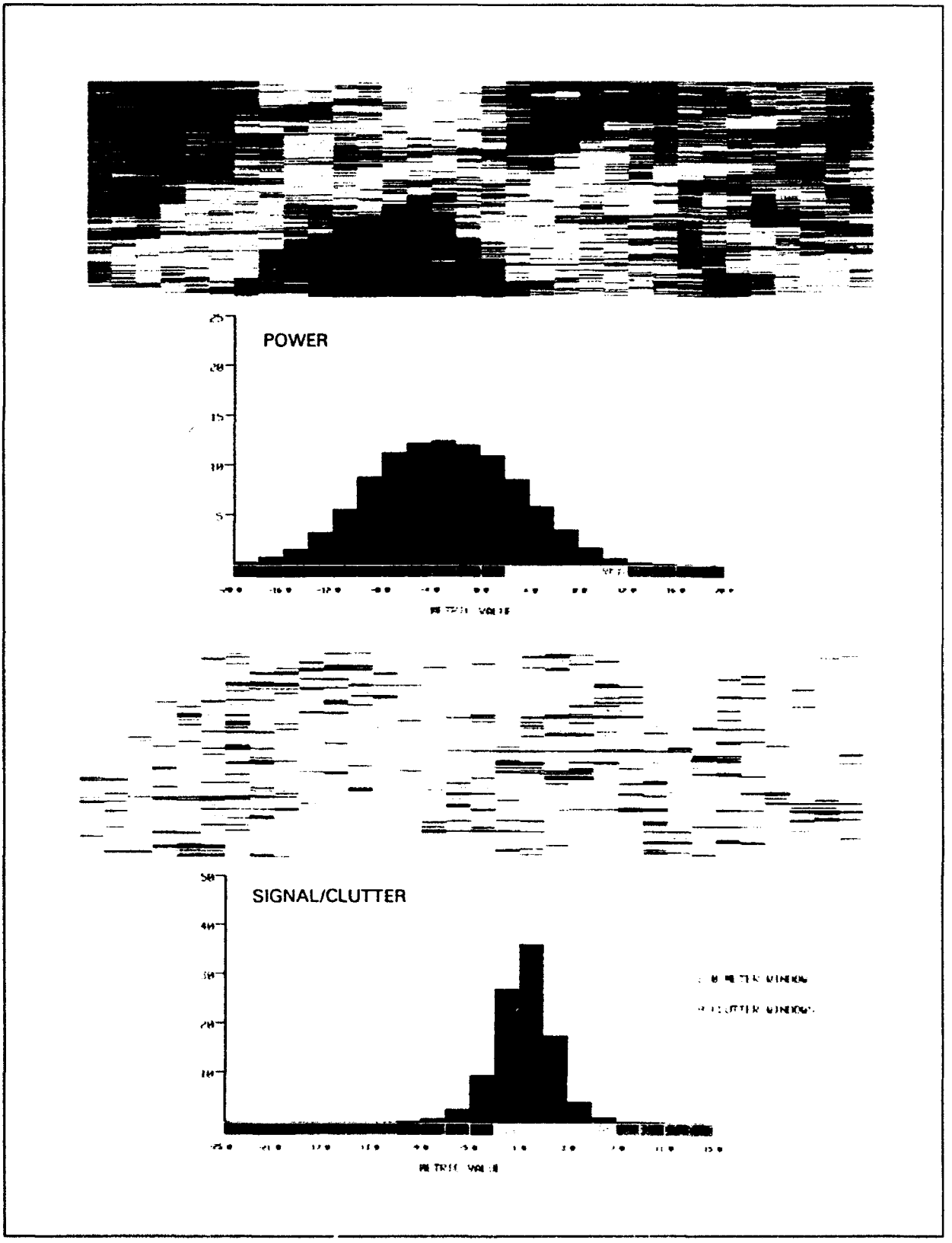


Figure C9. (Sheet 4 of 6)

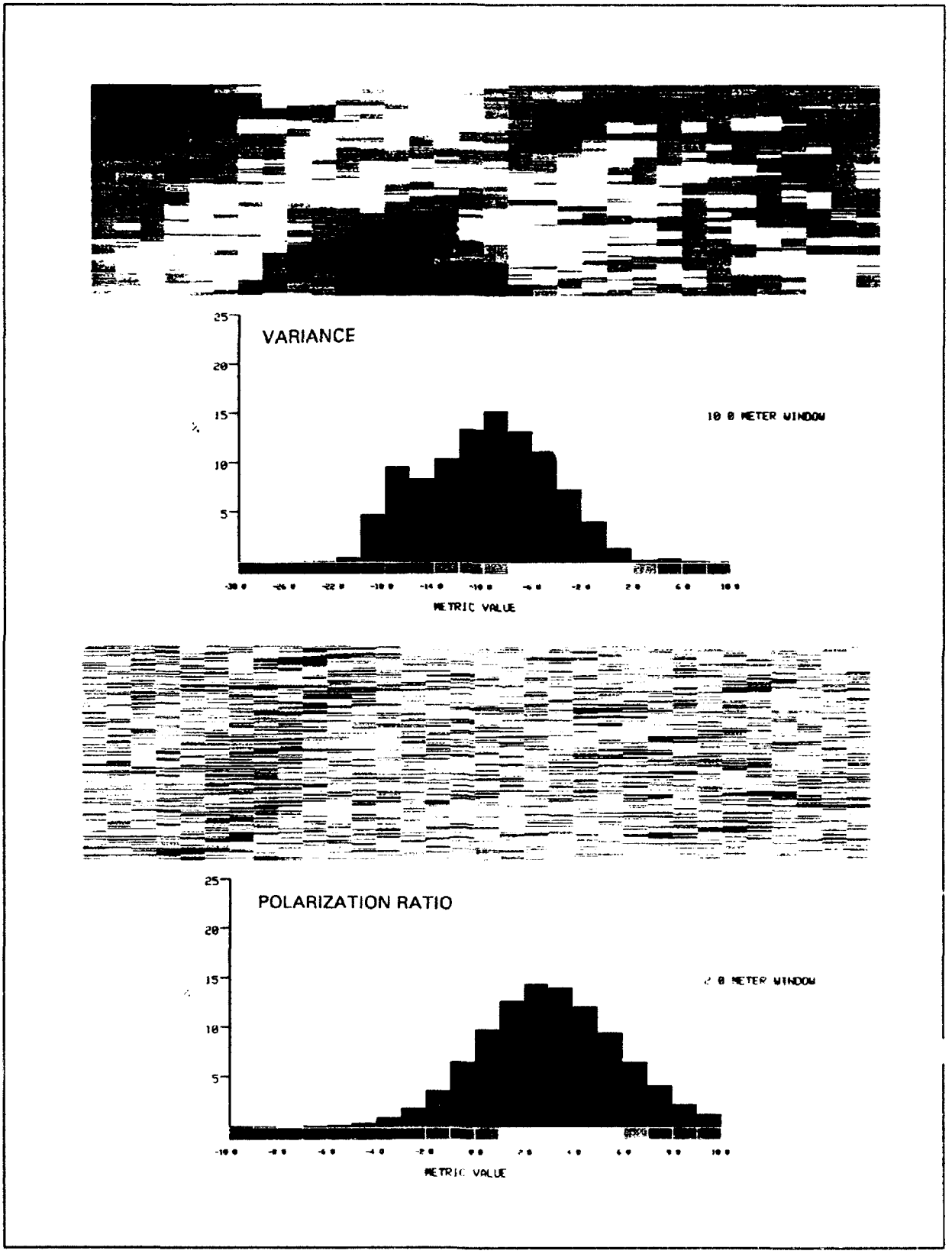
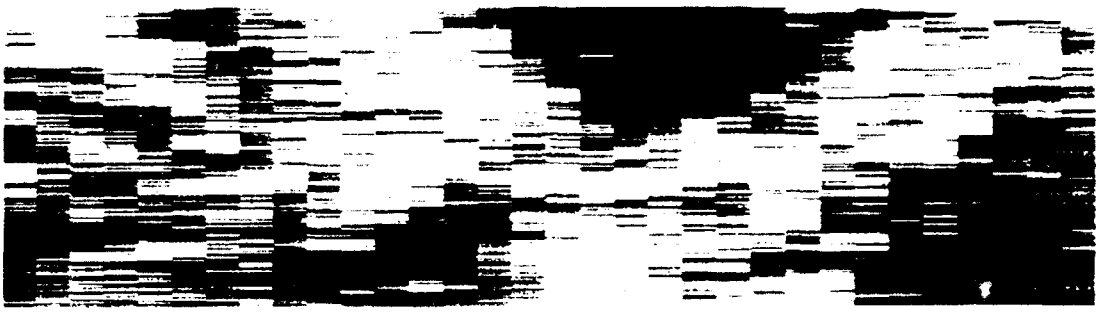


Figure C9. (Sheet 5 of 6)



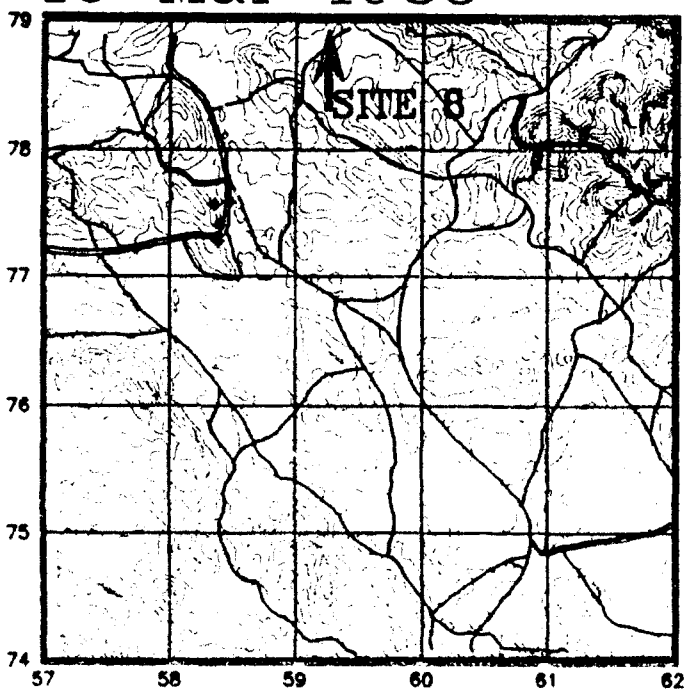
Measured data, log scale

Backscatter predictions, log scale

Terrain contours and vegetation overlay

Figure C9. (Sheet 6 of 6)

16 Mar 1988 0700 Test #MS5704



ENVIRONMENTAL DATA

ATMOSPHERIC:

AIR TEMPERATURE	11
RELATIVE HUMIDITY	99
BAROMETRIC PRESSURE	964
SOLAR LOADING	76
OBSERVED CONDITIONS	HEAVY FOG

SCENE

FIELD OF VIEW

AZ	203 9 50
EL	94 29 32
BDA	78.783

THERMAL

MEAN	286.737
MIN	286.746
MAX	286.746
STD DEV	0.000

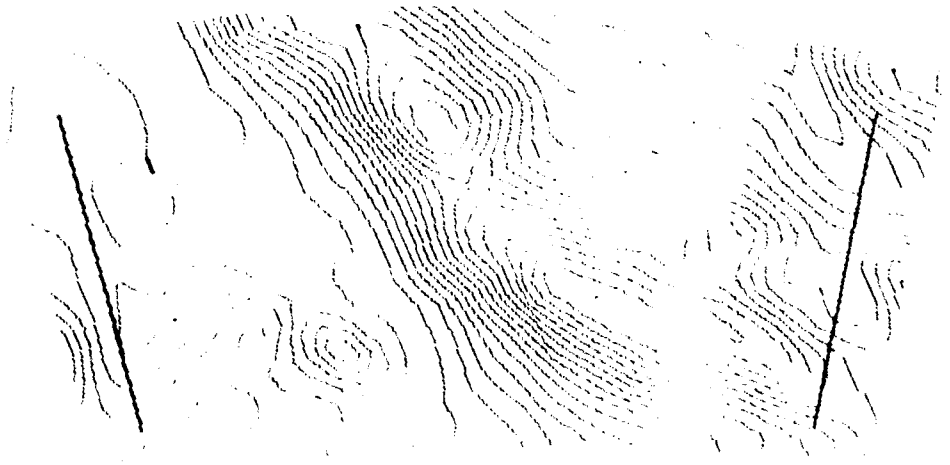
VISUAL

MEAN	0.00
MIN	0.00
MAX	0.00
STD DEV	0.00

TARGET	TYPE	RANGE	COORDINATES	AZIMUTH	ELEVATION	ORIEN	REMARKS
1703 ◆	M60	2469	58367728	200 37 16	94 30 31	RIGHT FRONT	
1704 ◆	M113	2349	58397741	201 36 37	94 49 11	RIGHT FRONT	
1705 ◆	M35	2213	58357757	204 9 50	94 59 36	LEFT FRONT	
1712 ◆	UH1	2154	58477759	201 30 3	95 22 16	CANCELLED	
1710 ◆	M60	2146	58477760	201 26 37	95 23 32	RIGHT REAR	

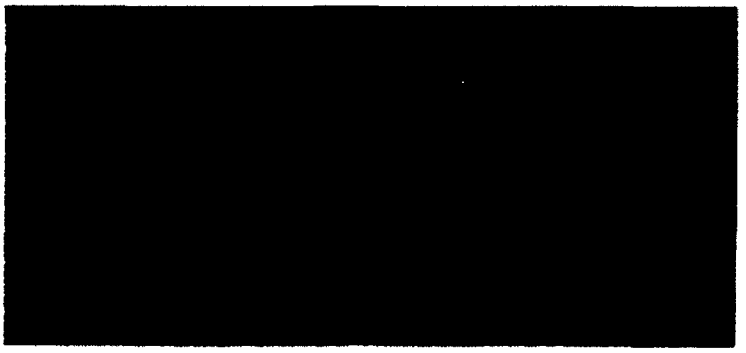
Figure C10. Summary data for MS5704 (Sheet 1 of 6)

Overhead photo

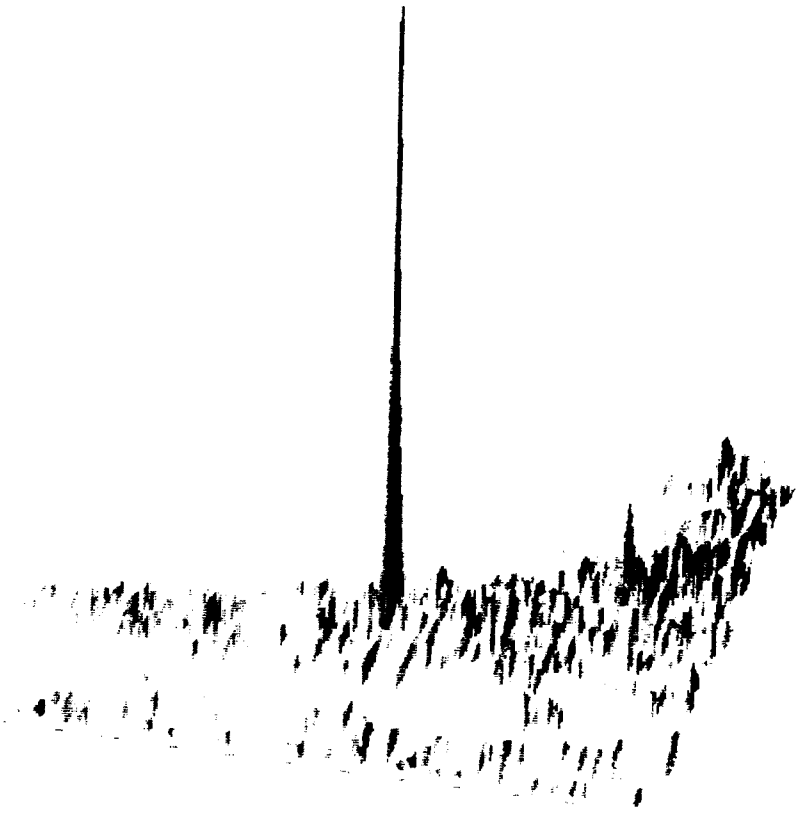


Terrain contours (10-ft interval)

Figure C10. (Sheet 2 of 6)



Measured data, linear scale



3-D plot of measured data, linear scale

Figure C10. (Sheet 3 of 6)

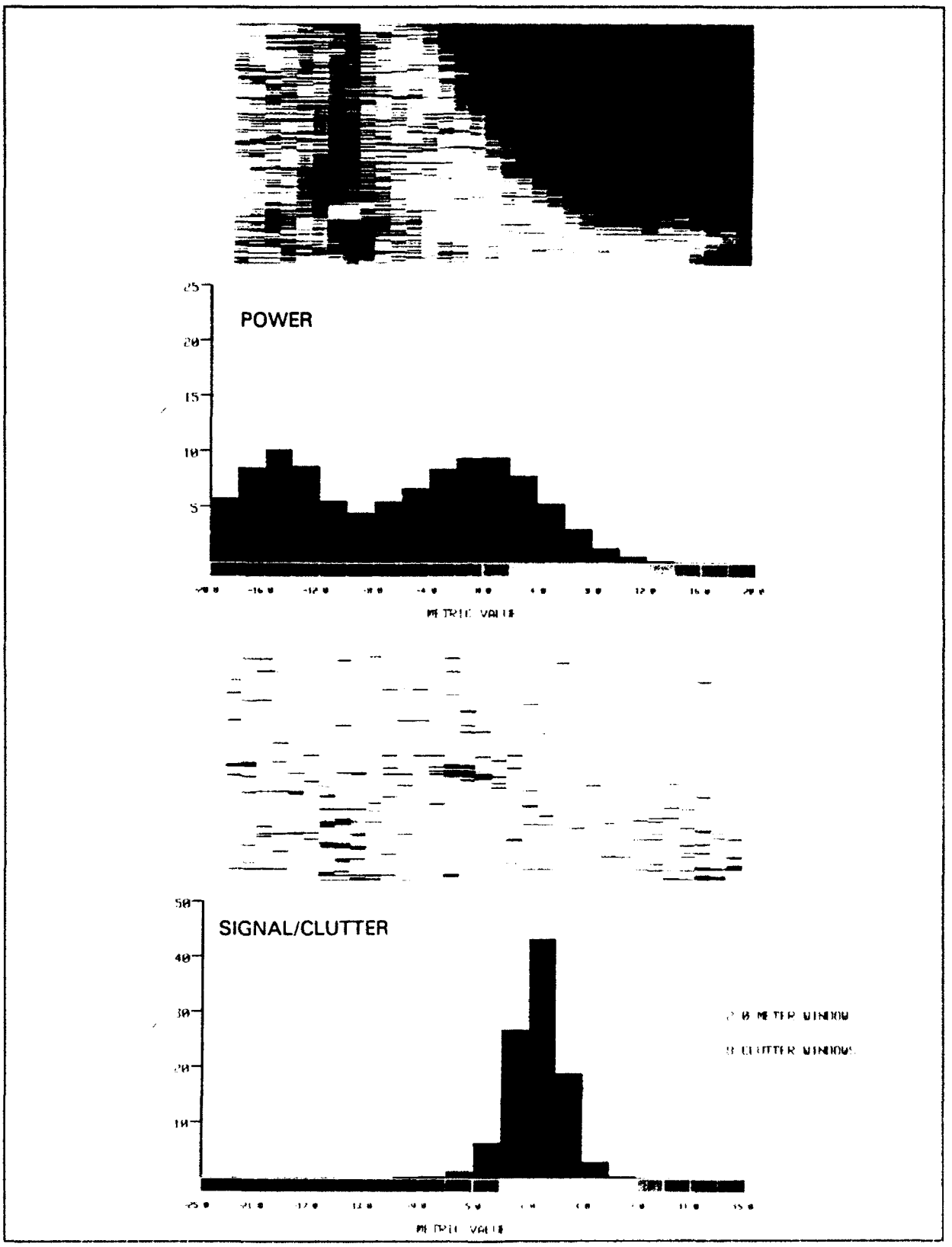


Figure C10. (Sheet 4 of 6)

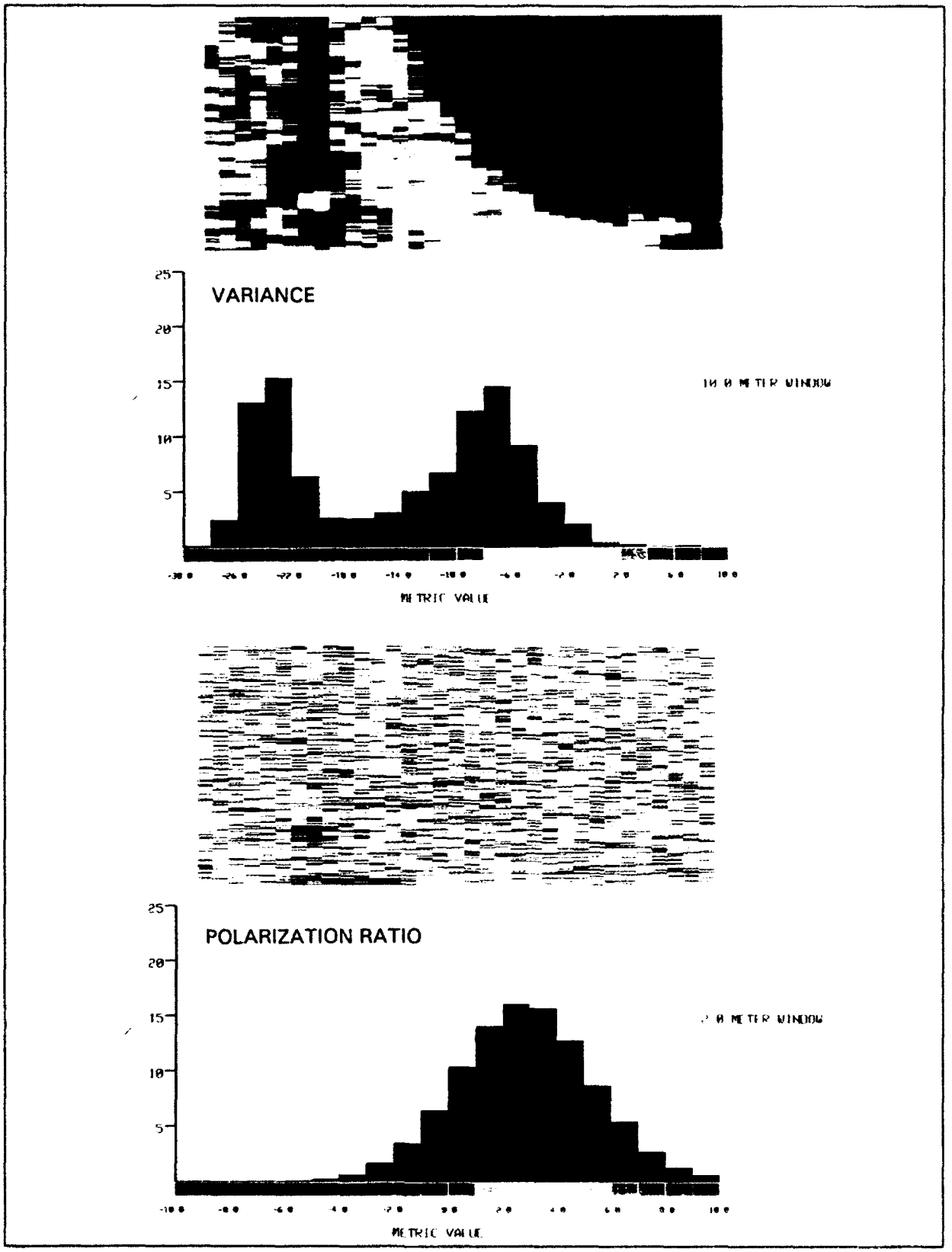
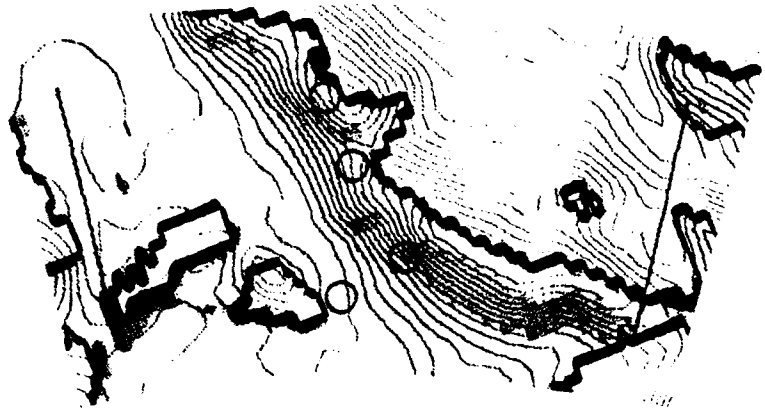
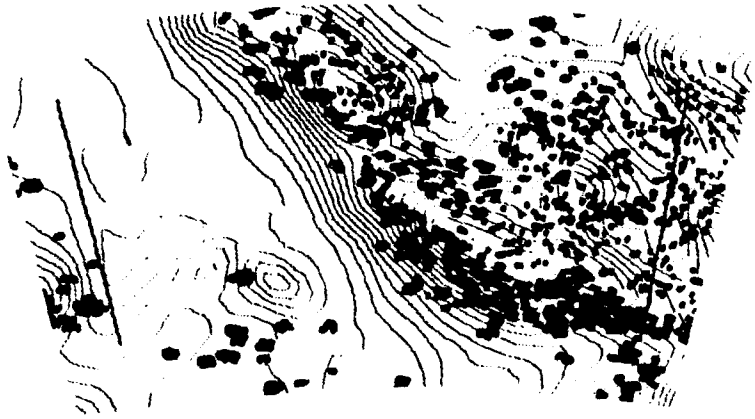


Figure C10. (Sheet 5 of 6)

Measured data, log scale



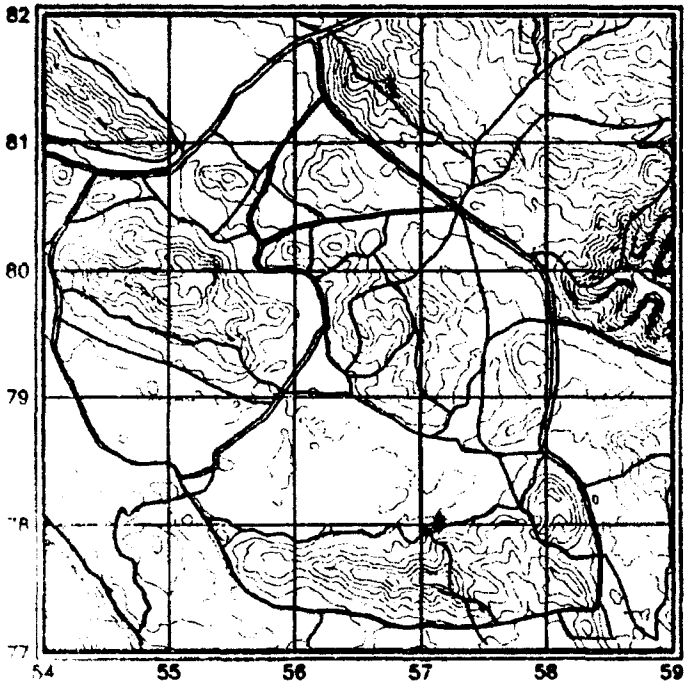
Backscatter predictions, log scale



Terrain contours and vegetation overlay

Figure C10. (Sheet 6 of 6)

16 Mar 1988 0815 Test #MS5801



ENVIRONMENTAL DATA

ATMOSPHERIC:

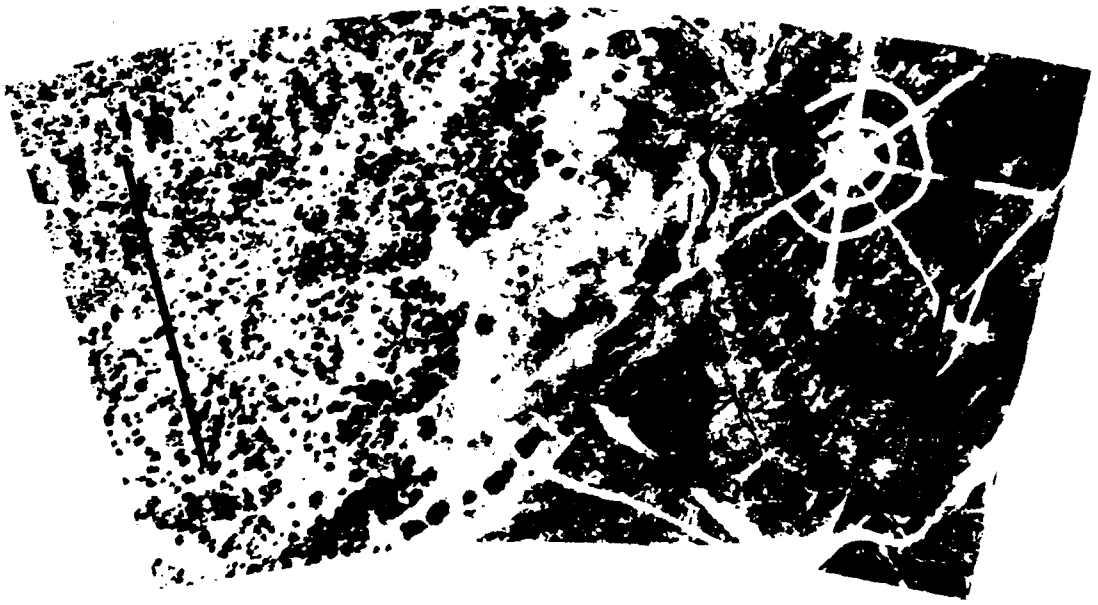
AIR TEMPERATURE (C)	15
RELATIVE HUMIDITY	96
BAROMETRIC PRESSURE	966
SOLAR LOADING	264
OBSERVED CONDITIONS	HEAVY FOG

SCENE:

FIELD OF VIEW	
AZ	232 54 28
EL	93 28 25
HDA	66.480
THERMAL	
MEAN	283.222
MIN	283.232
MAX	283.232
STD DEV	0.000
VISUAL	
MEAN	0.00
MIN	0.00
MAX	0.00
STD DEV	0.00

TARGET	TYPE	RANGE	COORDINATES	AZIMUTH	ELEVATION	ORIEN	REMARKS
603 ◆	M113	2612	57157805	233 54 28	94 4 18	FRONT	
602 ◆	M35	2657	57147798	232 46 8	93 55 7	RIGHT FRONT	
611 ◆	M60	2644	57137802	233 27 26	94 0 39	LEFT FRONT	
612 ◆	M60	2755	57047795	233 23 53	93 49 2	LEFT SIDE	

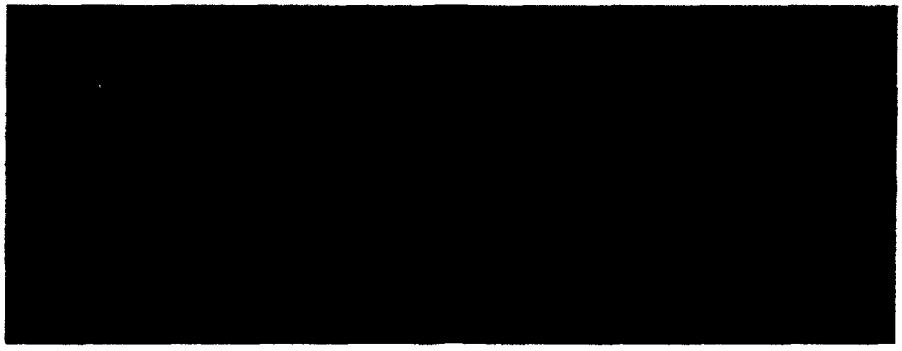
Figure C11. Summary data for MS5801 (Sheet 1 of 6)



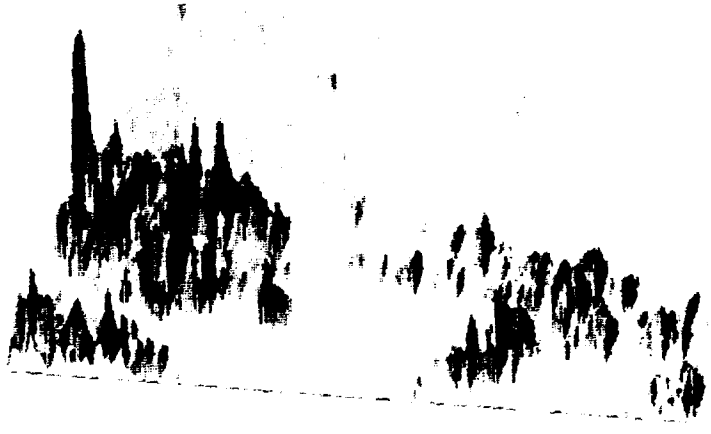
Overhead photo

Terrain contours (10-ft interval)

Figure C11. (Sheet 2 of 6)



Measured data, linear scale



3-D plot of measured data, linear scale

Figure C11. (Sheet 3 of 6)

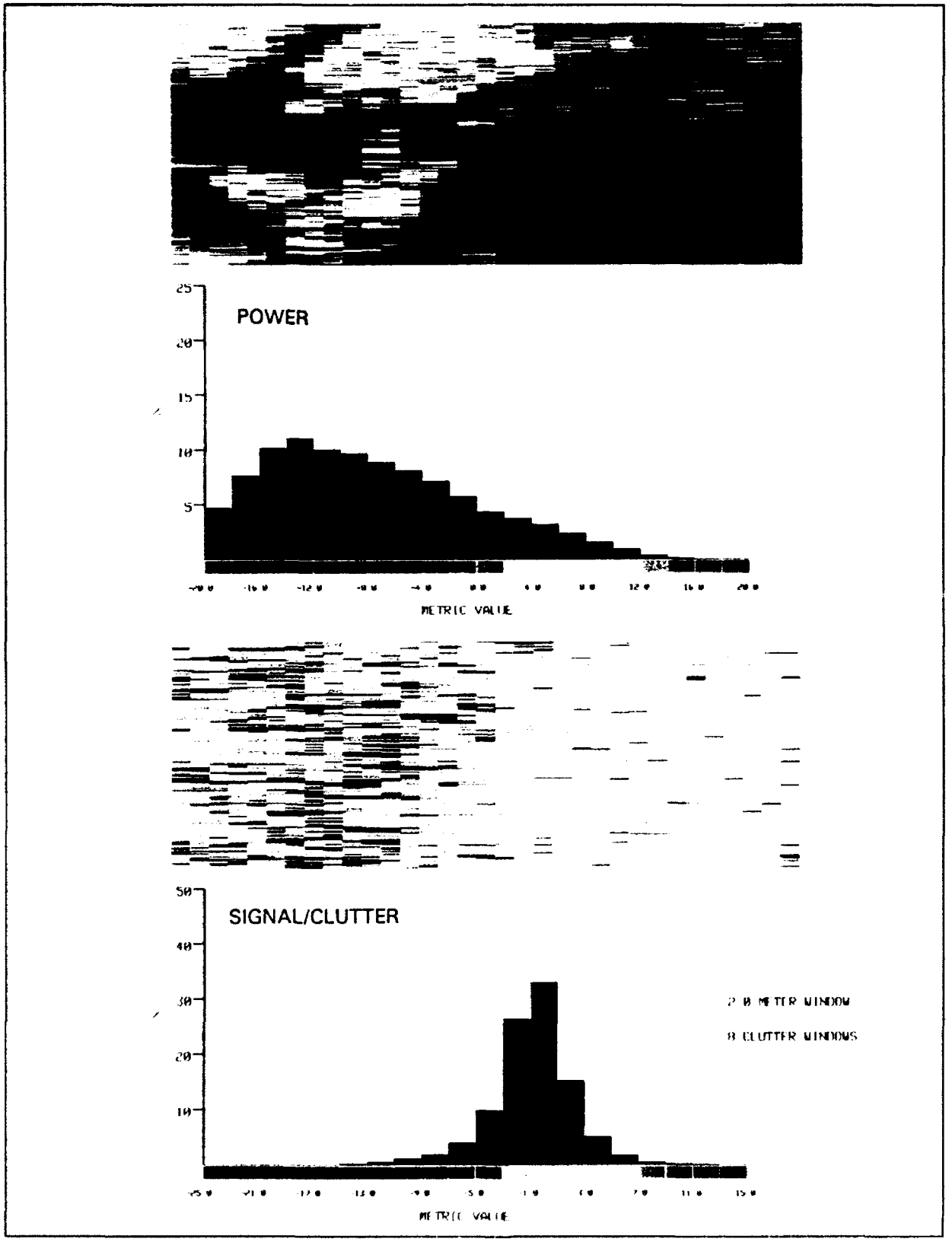


Figure C11. (Sheet 4 of 6)

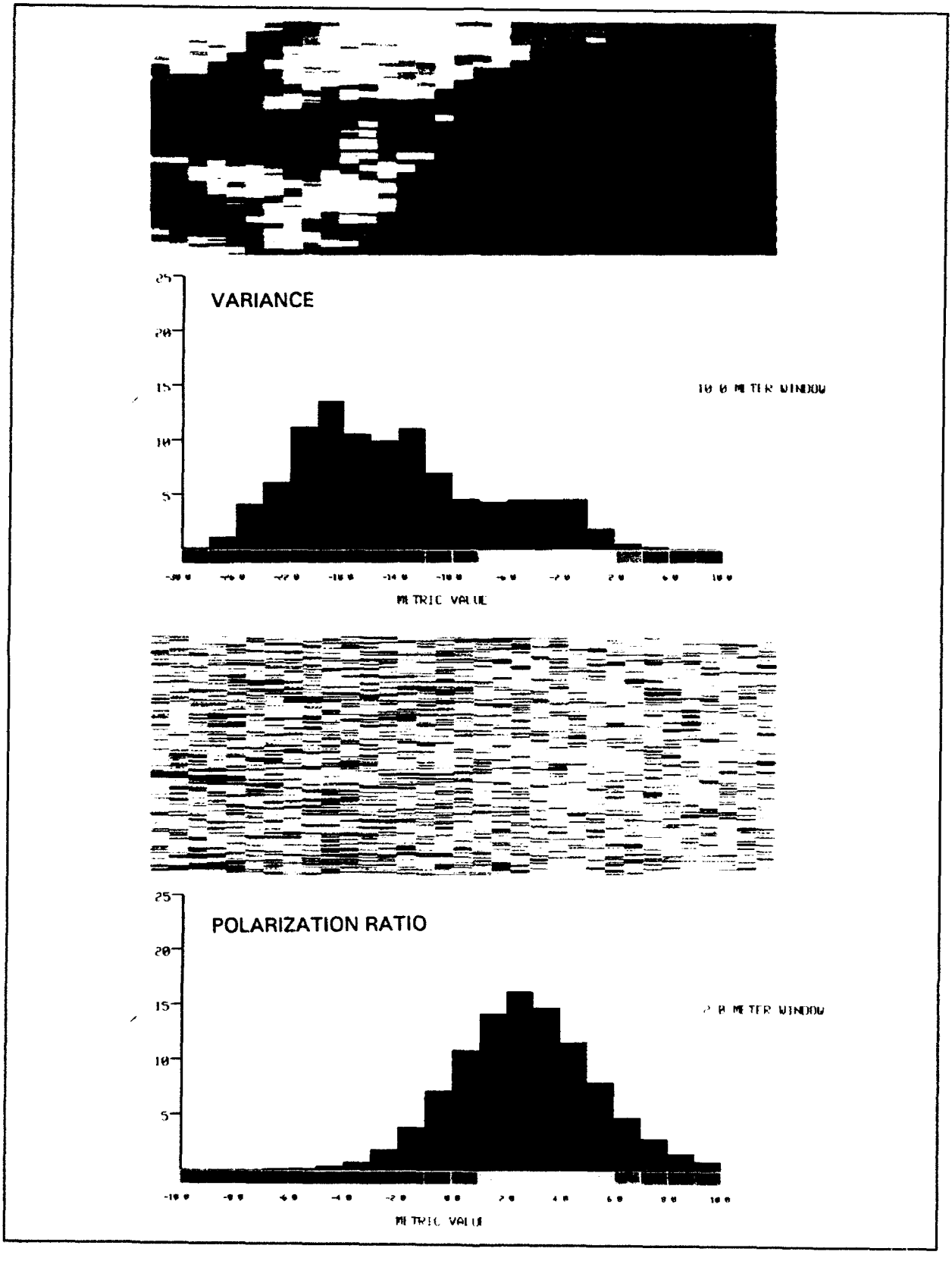
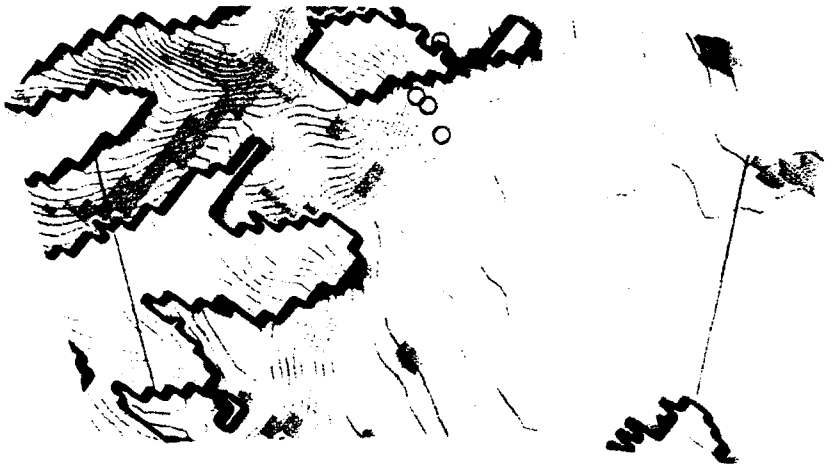
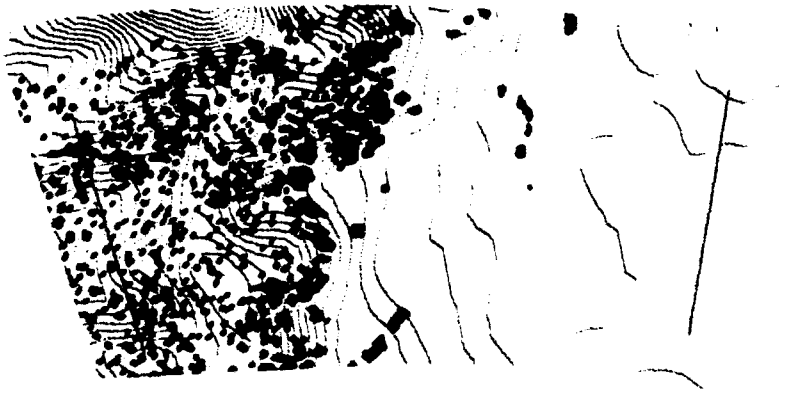


Figure C11. (Sheet 5 of 6)

Measured data, log scale



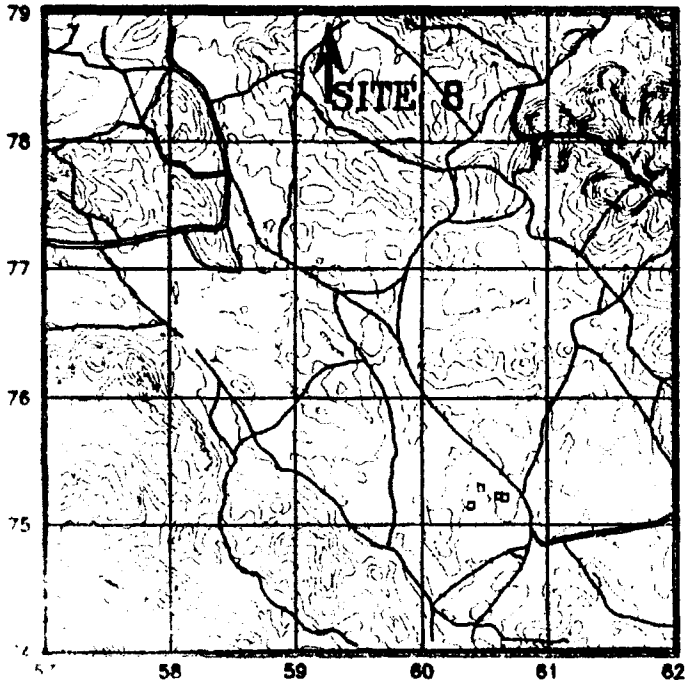
Backscatter predictions, log scale



Terrain contours and vegetation overlay

Figure C11. (Sheet 6 of 6)

16 Mar 1988 0855 Test #MS5802



ENVIRONMENTAL DATA

ATMOSPHERIC:

AIR TEMPERATURE	17
RELATIVE HUMIDITY	99
BAROMETRIC PRESSURE	966
SOLAR LOADING	356
OBSERVED CONDITIONS	HEAVY FOG

SCENE

FIELD OF VIEW

AZ	164 36 6
EL	91 49 20
BDA	128.737

THERMAL

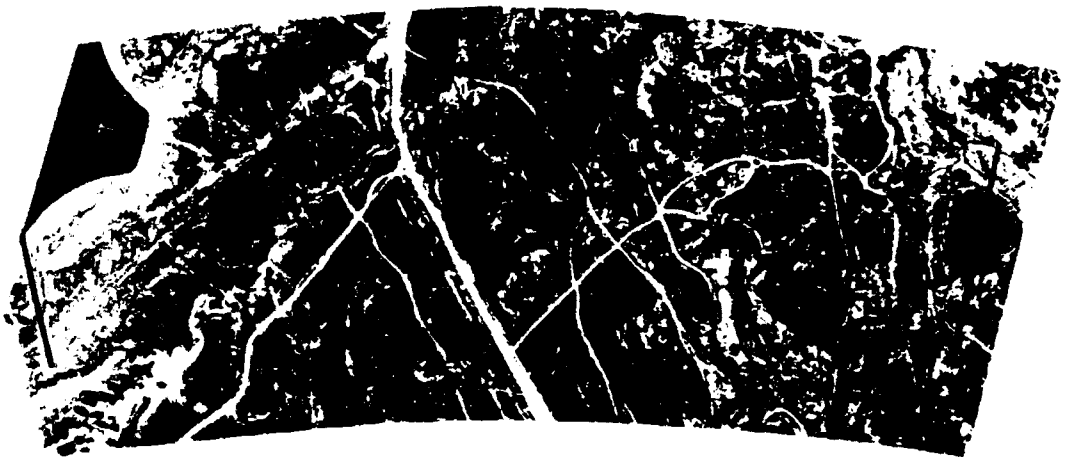
MEAN	283.479
MIN	283.479
MAX	283.479
STD DEV	0.000

VISUAL

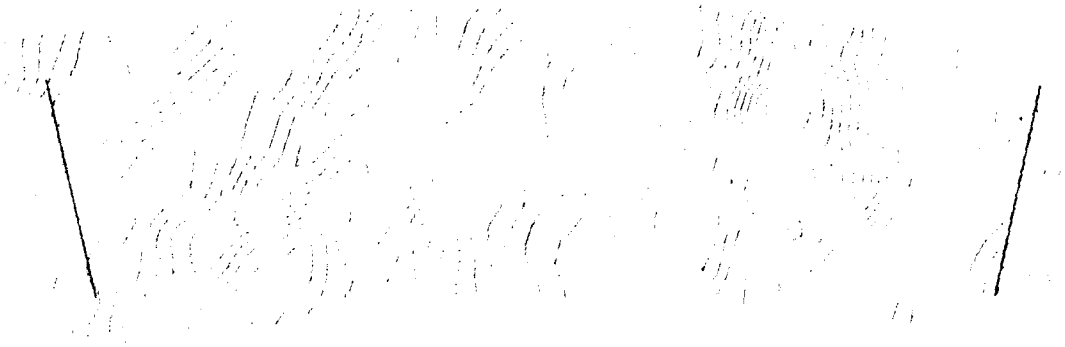
MEAN	0.00
MIN	0.00
MAX	0.00
STD DEV	0.00

TARGET	TYPE	RANGE	COORDINATES	AZIMUTH	ELEVATION	ORIEN	REMARKS
1302	DECOY	4456	60477530	164 8 39	92 43 20	FRONT	
1303	M60	4574	60397516	165 36 6	92 42 46	RIGHT FRONT	
1305	M113	4566	60617523	162 36 1	92 36 40	RIGHT FRONT	
1307	M35	4596	60667522	162 8 49	92 30 53	RIGHT FRONT	

Figure C12. Summary data for MS5802 (Sheet 1 of 6)



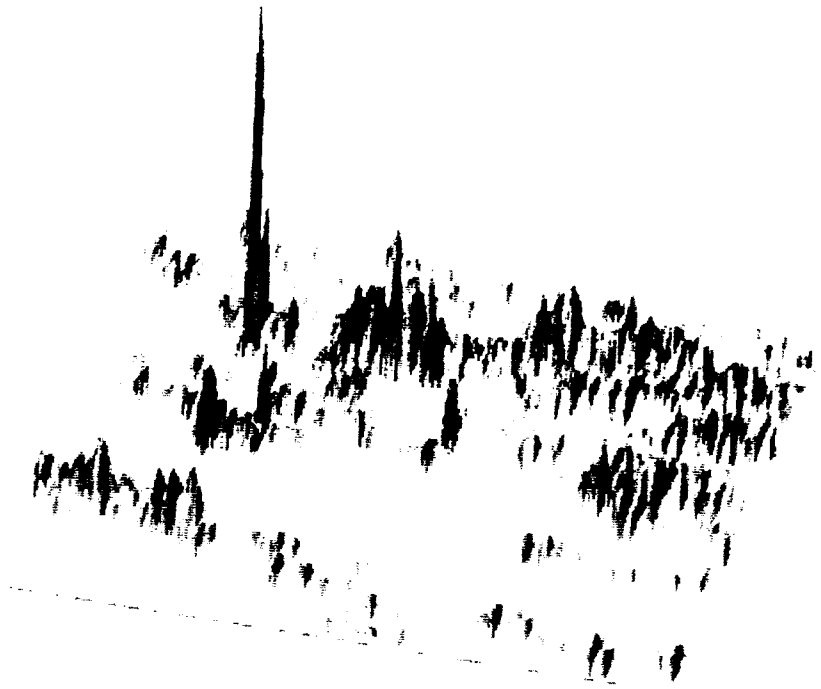
Overhead photo



Terrain contours (10-ft interval)

Figure C12. (Sheet 2 of 6)

Measured data, linear scale



3-D plot of measured data, linear scale

Figure C12. (Sheet 3 of 6)

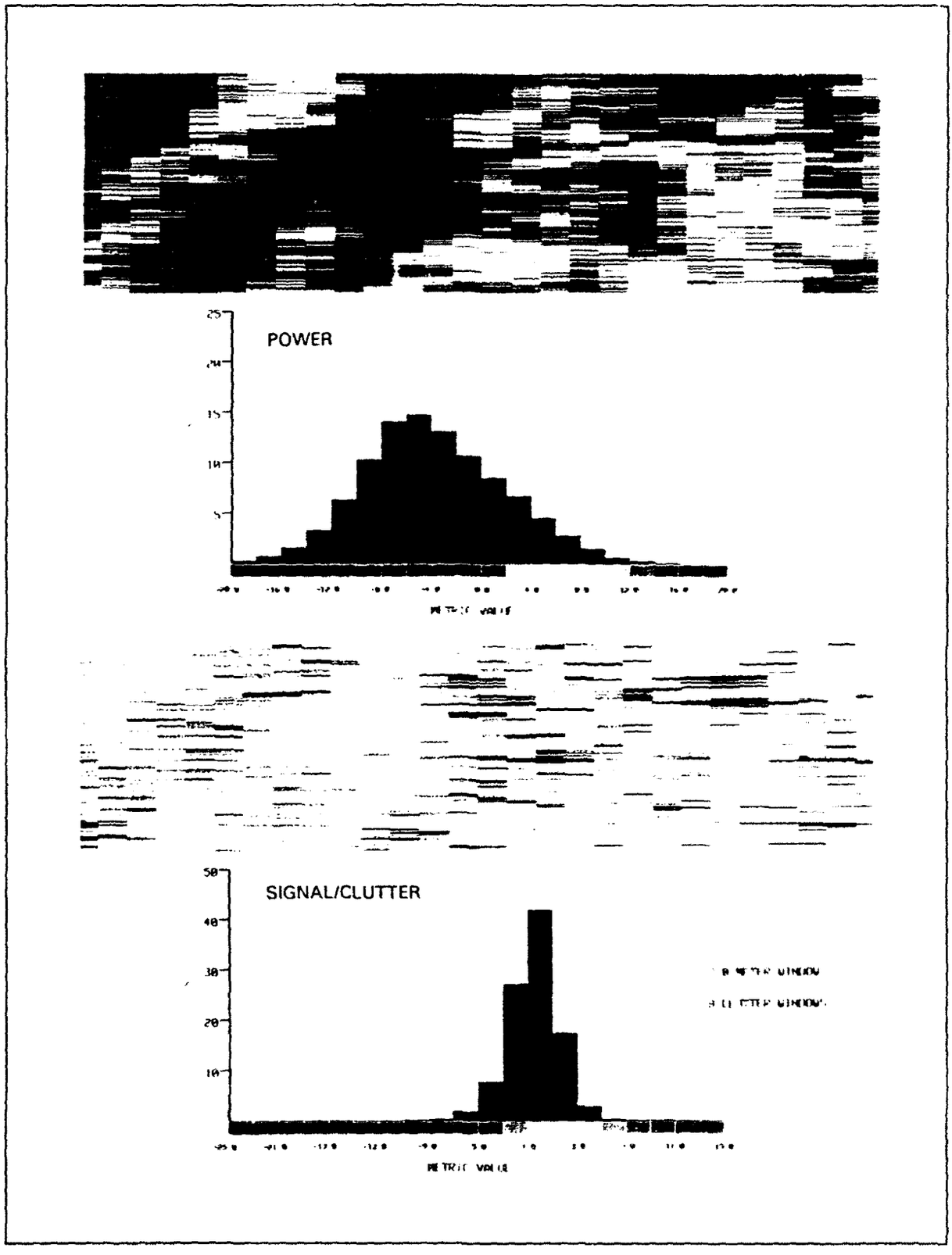


Figure C12. (Sheet 4 of 6)

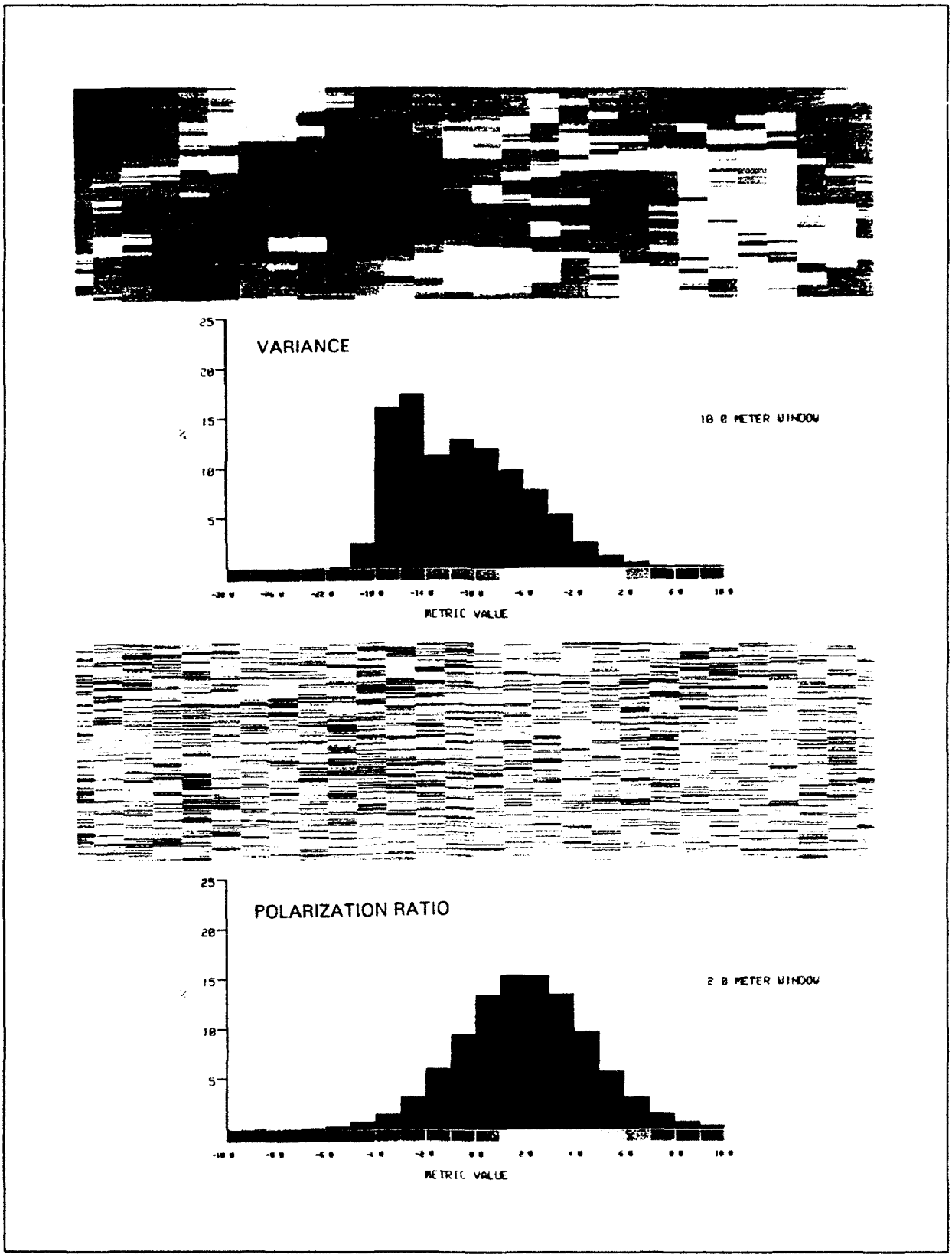
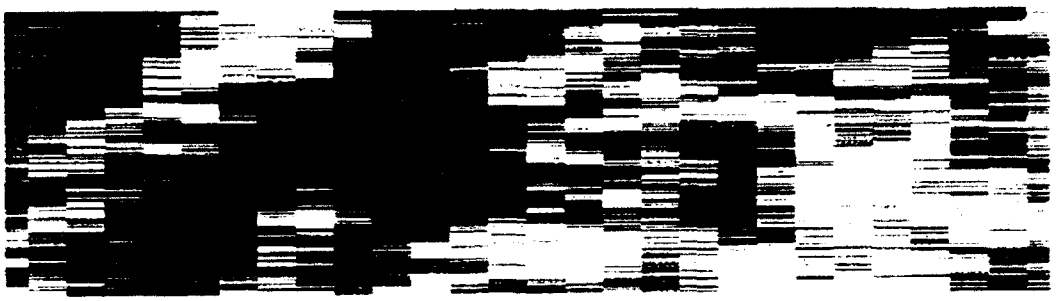
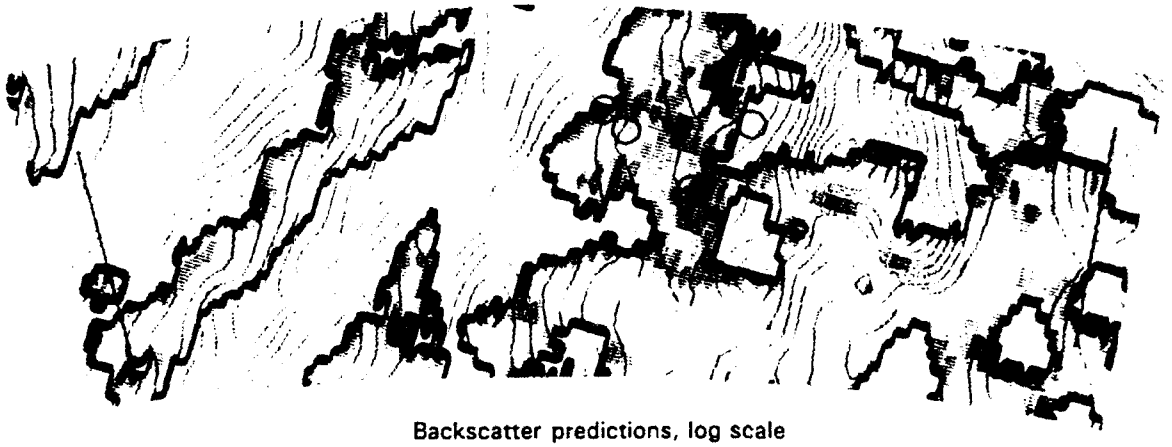


Figure C12. (Sheet 5 of 6)



Measured data, log scale

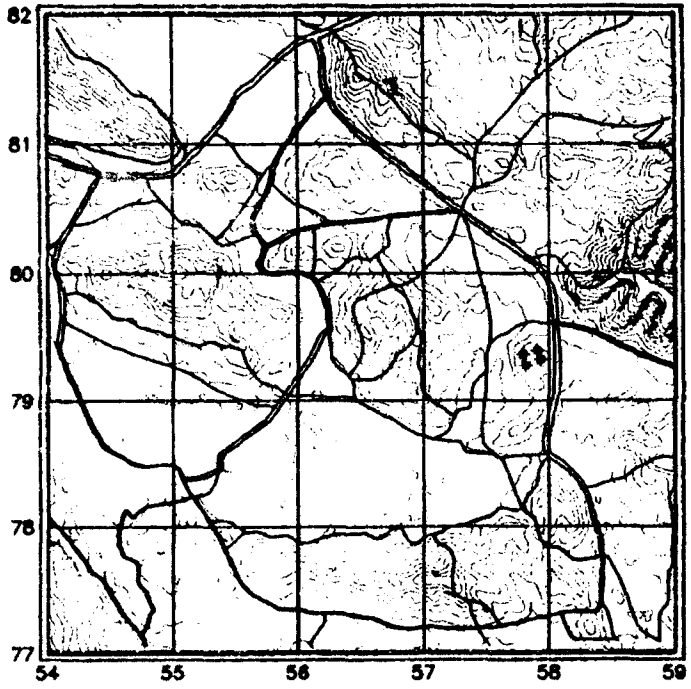


Backscatter predictions, log scale

Terrain contours and vegetation overlay

Figure C12. (Sheet 6 of 6)

16 Mar 1988 0935 Test #MS5803



ENVIRONMENTAL DATA

ATMOSPHERIC:

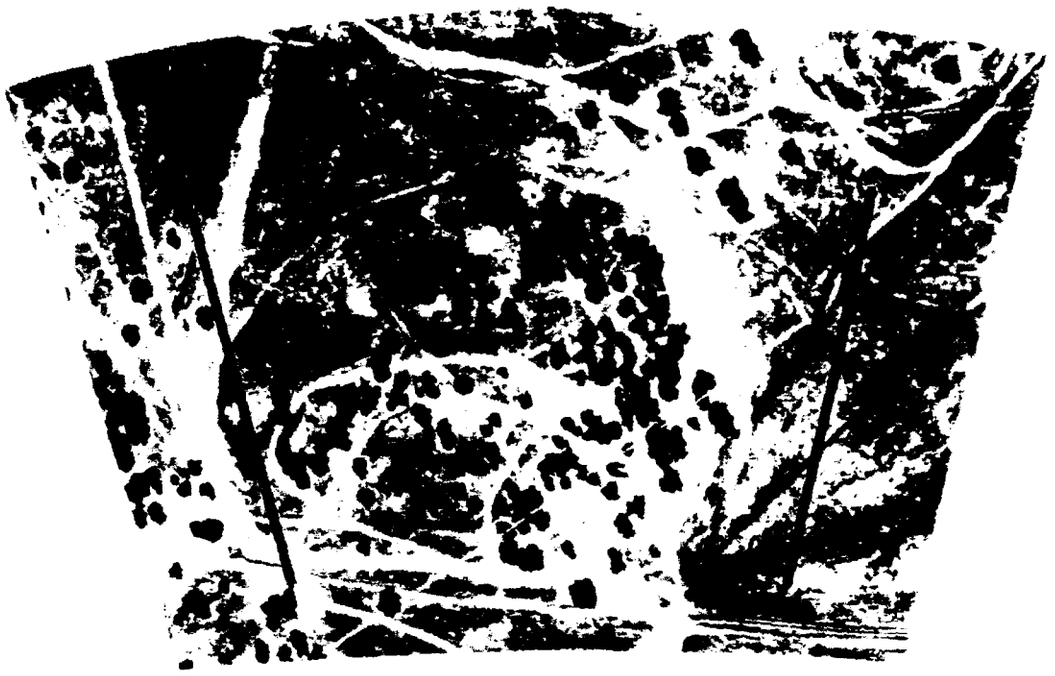
AIR TEMPERATURE (C)	12
RELATIVE HUMIDITY	99
BAROMETRIC PRESSURE	966
SOLAR LOADING	763
OBSERVED CONDITIONS	HEAVY FOG

SCENE:

FIELD OF VIEW		
	AZ	260 41 40
	EL	94 57 7
	BDA	64.199
THERMAL		
	MEAN	273.516
	MIN	273.544
	MAX	273.544
	STD DEV	0.000
VISUAL		
	MEAN	0.00
	MIN	0.00
	MAX	0.00
	STD DEV	0.00

TARGET	TYPE	RANGE	COORDINATES	AZIMUTH	ELEVATION	ORIEN	REMARKS
101	ZSU	1481	57817927	257 47 1	95 36 26	REAR	
104	M113	1484	57797936	261 9 8	95 15 59	FRONT	
105	M60	1376	57907939	261 41 40	95 37 20	LEFT SIDE	
106	M60	1362	57937932	258 37 21	95 51 7	REAR	

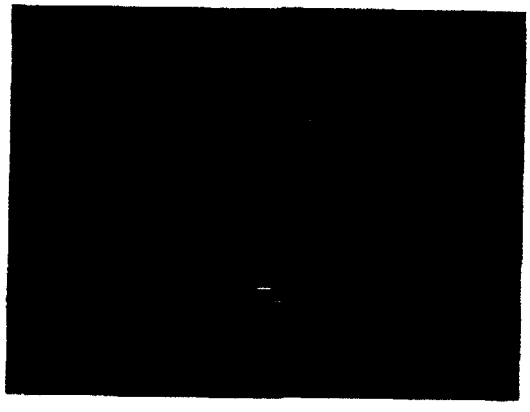
Figure C13. Summary data for MS5803 (Sheet 1 of 6)



Overhead photo

Terrain contours (10-ft interval)

Figure C13. (Sheet 2 of 6)



Measured data, linear scale

3-D plot of measured data, linear scale

Figure C13. (Sheet 3 of 6)

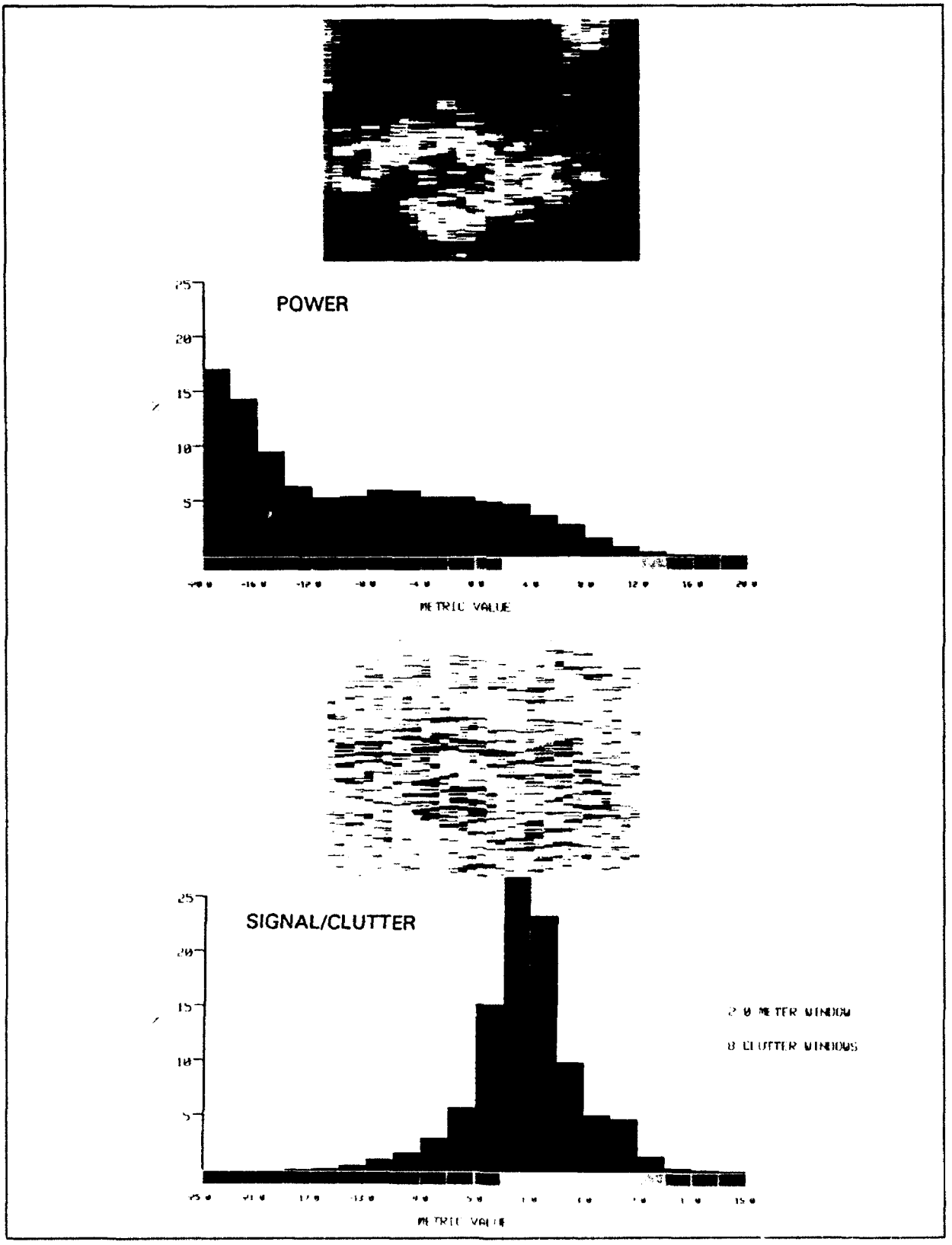


Figure C13. (Sheet 4 of 6)

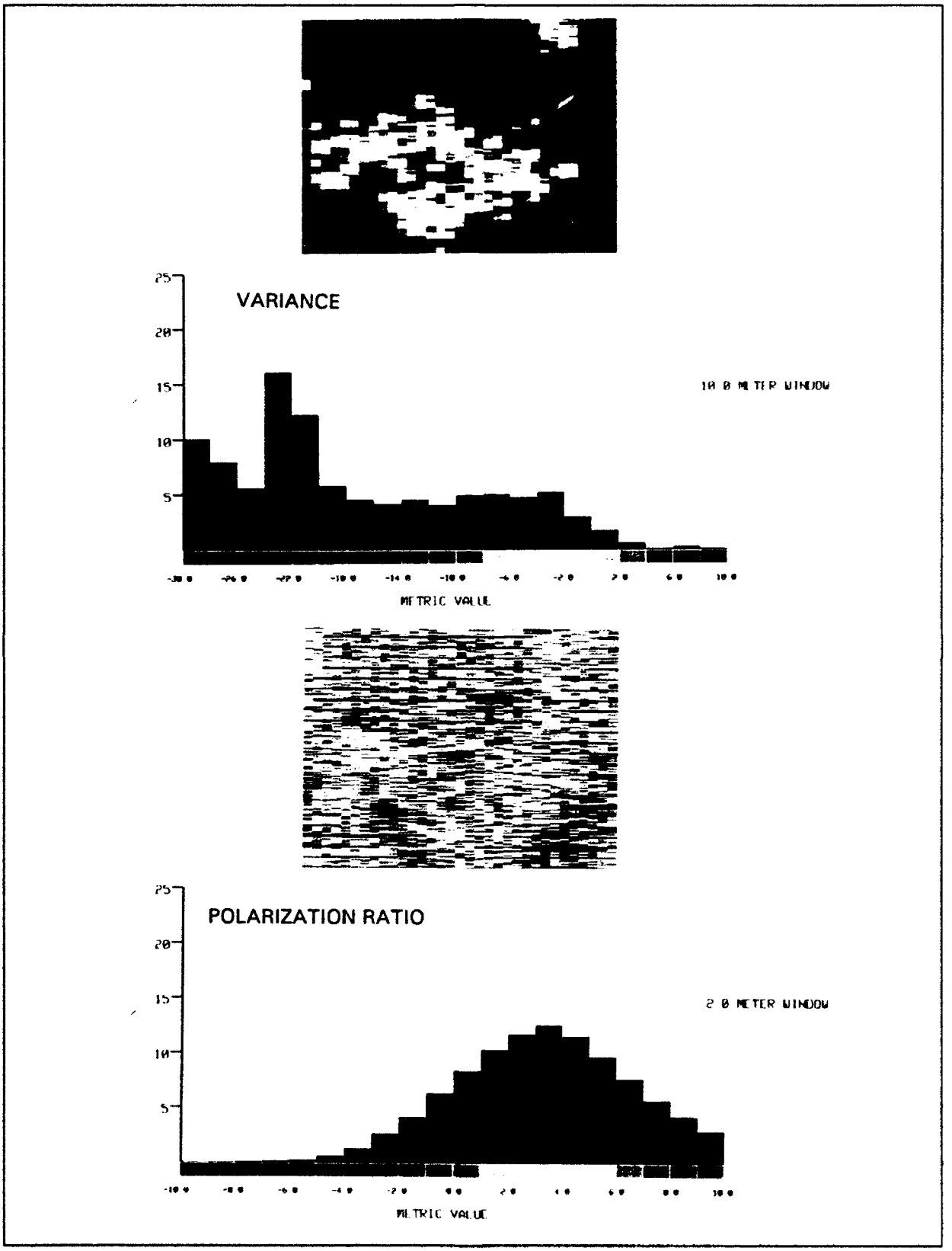
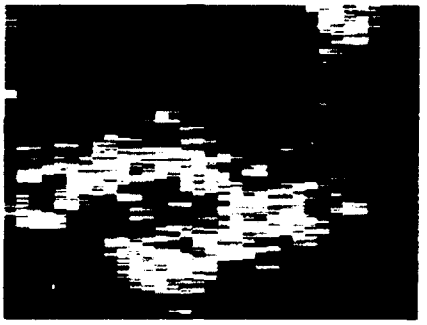
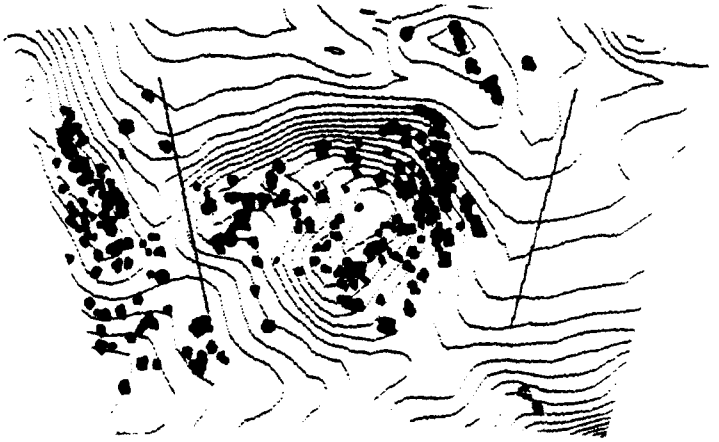


Figure C13. (Sheet 5 of 6)



Measured data, log scale

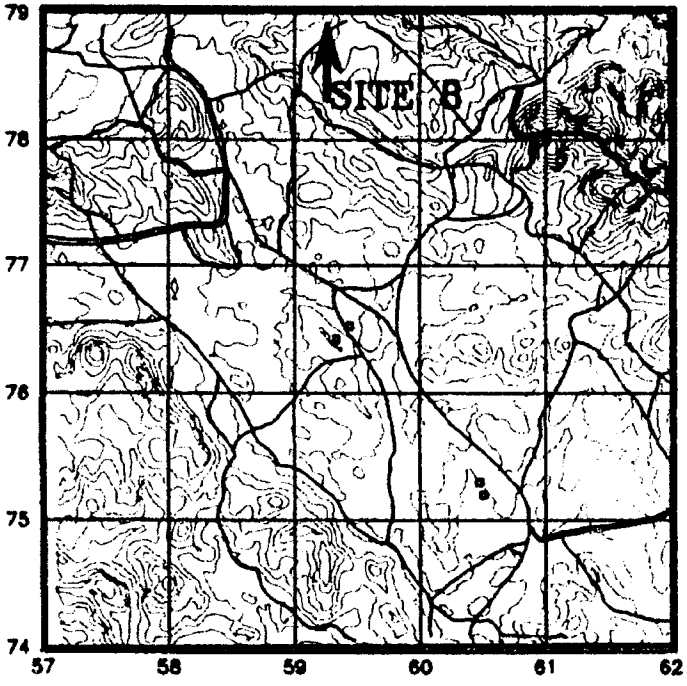
Backscatter predictions, log scale



Terrain contours and vegetation overlay

Figure C13. (Sheet 6 of 6)

16 Mar 1988 1015 Test #MS5804



ENVIRONMENTAL DATA

ATMOSPHERIC

AIR TEMPERATURE	7
RELATIVE HUMIDITY	95
BAROMETRIC PRESSURE	967
SOLAR LOADING	677
OBSERVED CONDITIONS	LIGHT HAZE

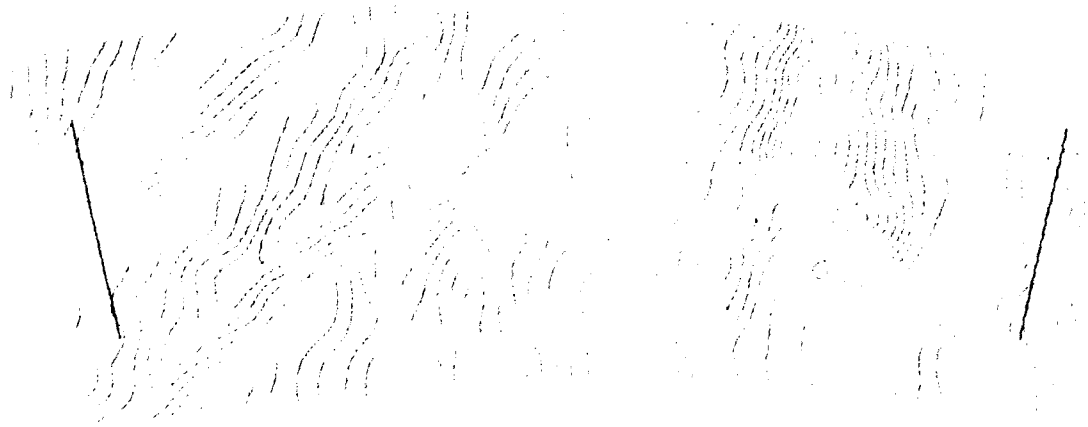
SCENE

FIELD OF VIEW	SCENE A	SCENE B
AZ	177 35 22	164 44 57
EL	93 0 1	92 41 27
BDA	127.409	132.830
THERMAL		
MEAN	276.719	276.624
MIN	273.993	272.190
MAX	281.998	281.322
STD DEV	1.226	0.858
VISUAL		
MEAN	0.00	0.00
MIN	0.00	0.00
MAX	0.00	0.00
STD DEV	0.00	0.00

TARGET	TYPE	RANGE	COORDINATES	AZIMUTH	ELEVATION	ORIEN	REMARKS
1302 ▫	M60	4456	60477530	164 17 18	92 11 42	RIGHT SIDE	IN OPEN
1304 ▫	M113	4570	60507520	164 16 21	92 6 15	FRONT	IN OPEN
1502 ▫	M60	3065	59447653	176 40 44	93 10 19	REAR	IN OPEN
1505 ▫	M113	3163	59337643	176 43 53	92 46 21	FRONT	BESIDE TREE

Figure C14. Summary data for MS5804 (Sheet 1 of 6)

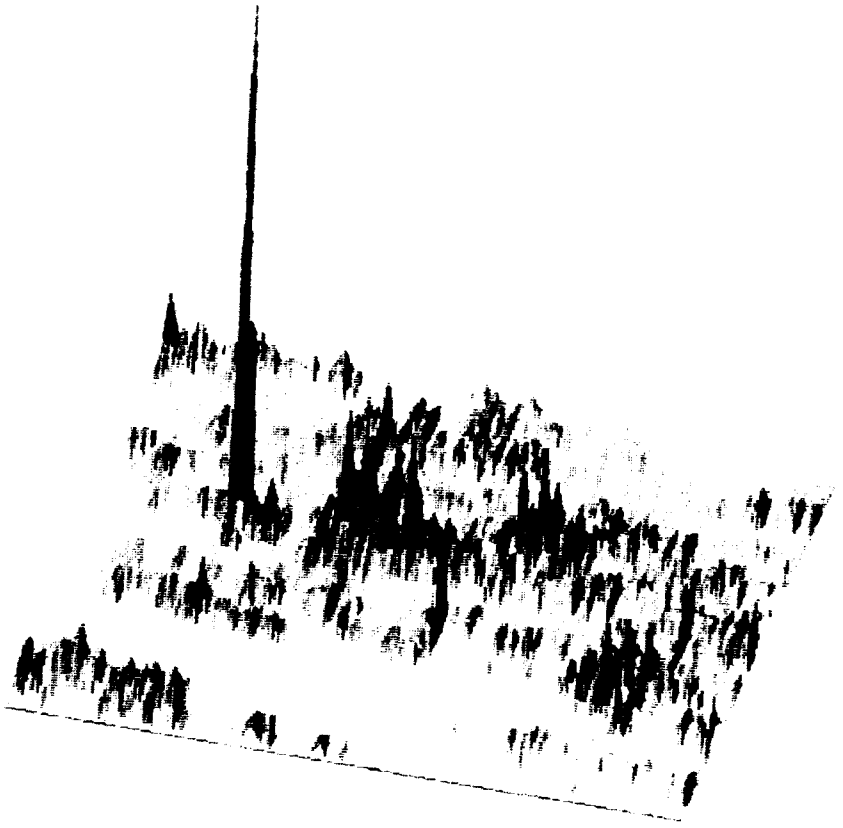
Overhead photo



Terrain contours (10-ft interval)

Figure C14. (Sheet 2 of 6)

Measured data, linear scale



3-D plot of measured data, linear scale

Figure C14. (Sheet 3 of 6)

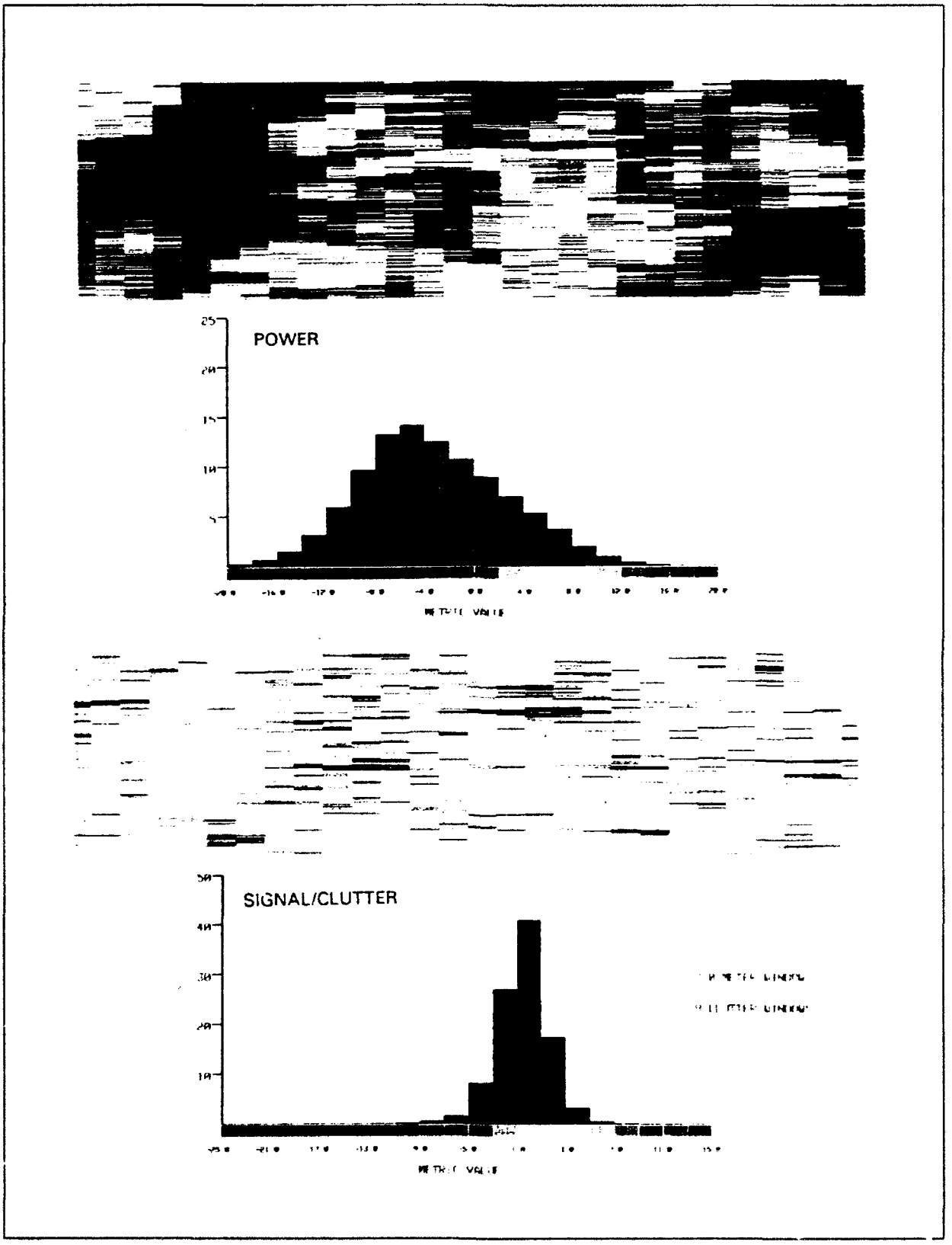


Figure C14. (Sheet 4 of 6)

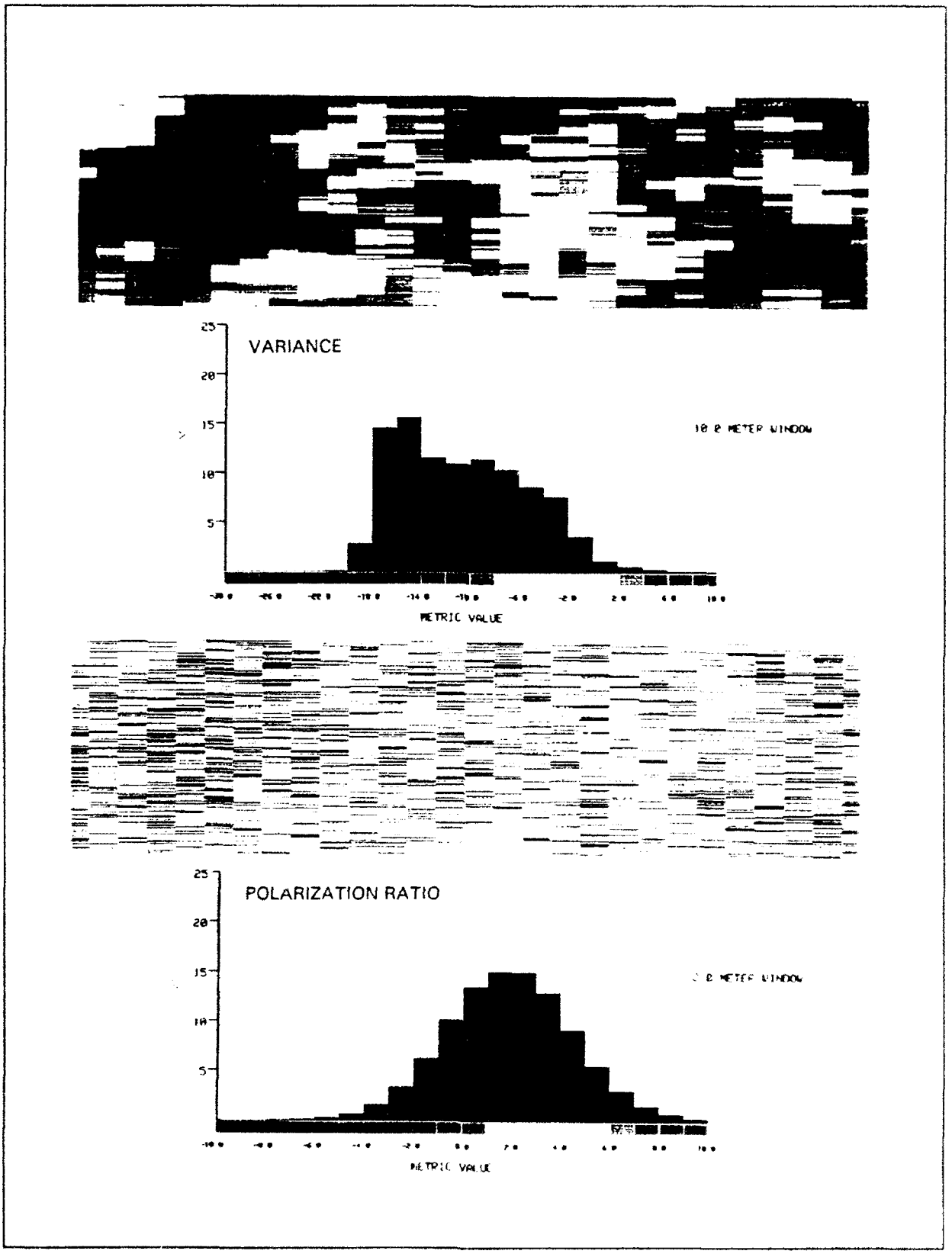


Figure C14. (Sheet 5 of 6)

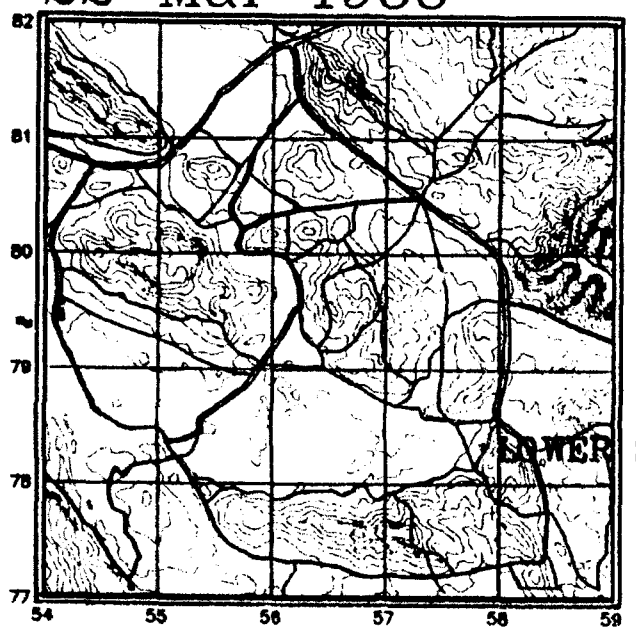
Measured data, log scale

Backscatter predictions, log scale

Terrain contours and vegetation overlay

Figure C14. (Sheet 6 of 6)

22 Mar 1988 0850 Test #MS6001



ENVIRONMENTAL DATA

ATMOSPHERIC:

AIR TEMPERATURE (C)	13
RELATIVE HUMIDITY	60
BAROMETRIC PRESSURE	966
SOLAR LOADING	576
OBSERVED CONDITIONS	CLEAR

SCENE:	SCENE A	SCENE B
FIELD OF VIEW		
AZ	287 23 33	284 38 10
EL	89 22 11	90 10 37
FOV	31.466	32.920
THERMAL		
MEAN	283.666	283.954
MIN	281.226	281.226
MAX	289.606	291.379
STD DEV	1.232	1.343
VISUAL		
MEAN	4367.69	4852.86
MIN	2150.00	2034.00
MAX	8166.00	10377.00
STD DEV	813.20	1063.00

TARGET	TYPE	RANGE	COORDINATES	AZIMUTH	ELEVATION	ORIEN	REMARKS
2501 *	M36	3919	54157967	286 24 59	90 11 46	LEFT FRONT	UNDER TREES
2502 *	M36	3898	54147948	287 16 32	90 16 48	LEFT FRONT	UNDER TREES
2503 *	M113	3878	54157943	286 33 24	90 14 36	LEFT SIDE	UNDER TREES
2901 *	M60	4142	53667937	284 32 15	90 11 13	REAR	BEHIND TREETOP
2903 *	M113	4211	53797940	284 45 24	90 11 16	RIGHT SIDE	BEHIND TREE

Figure C15. Summary data for MS6001 (Sheet 1 of 7)

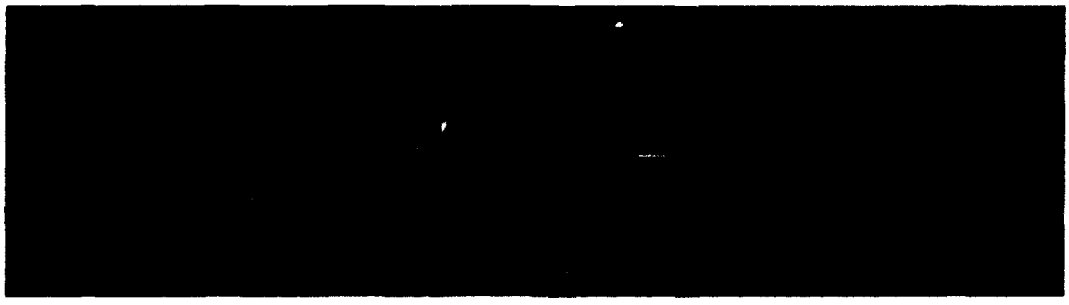
CCD photo

Figure C15. (Sheet 2 of 7)

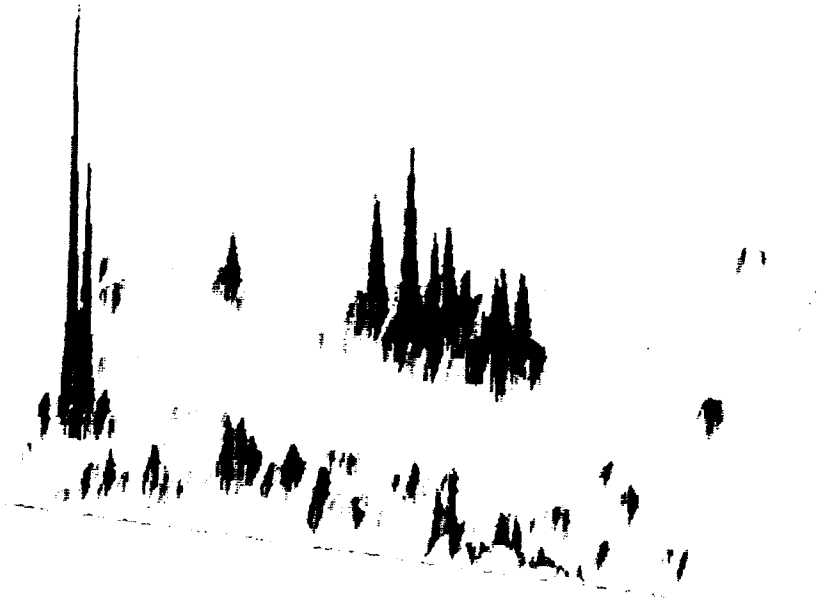
Overhead photo

Terrain contours (10-ft interval)

Figure C15. (Sheet 3 of 7)



Measured data, linear scale



3-D plot of measured data, linear scale

Figure C15. (Sheet 4 of 7)

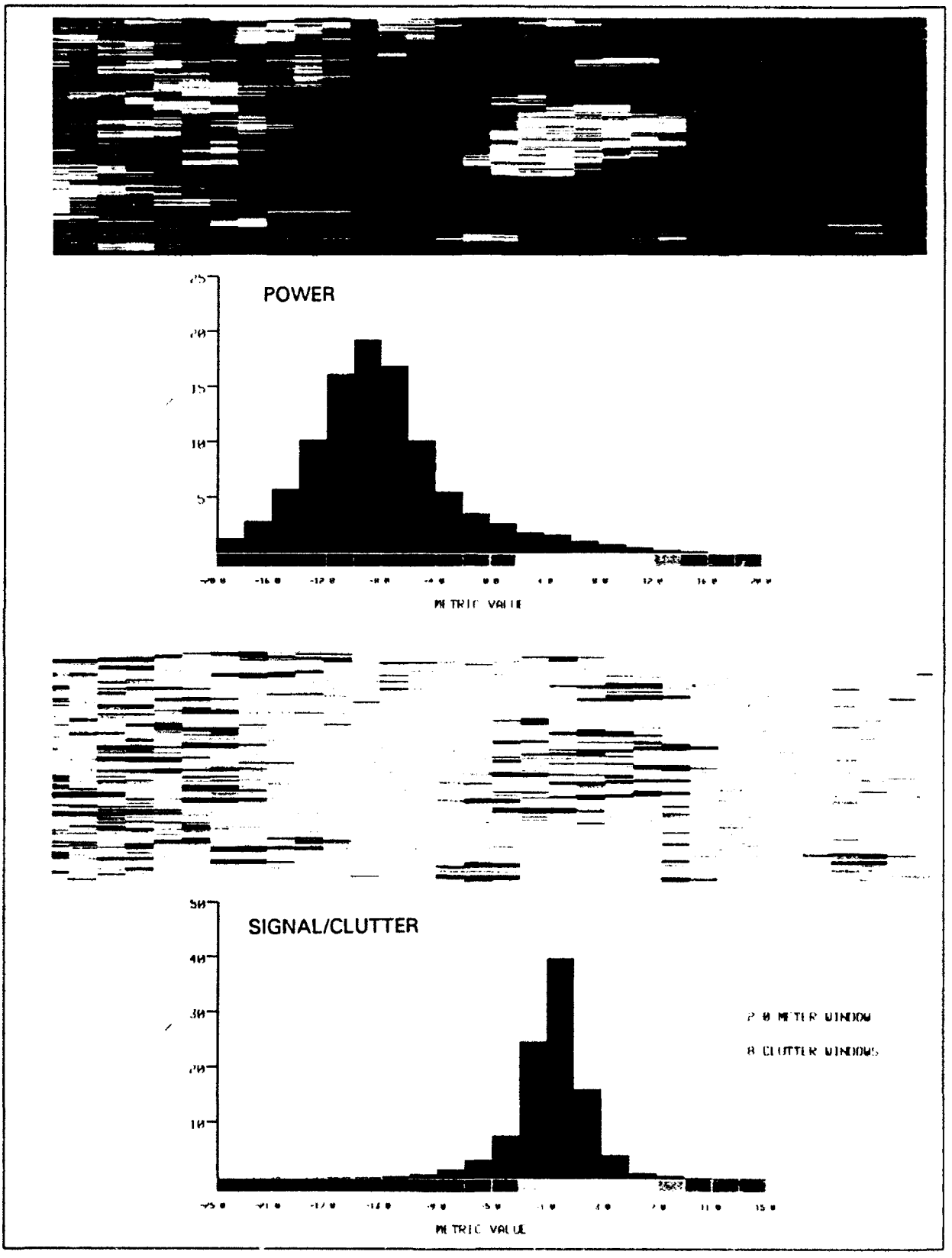


Figure C15. (Sheet 5 of 7)

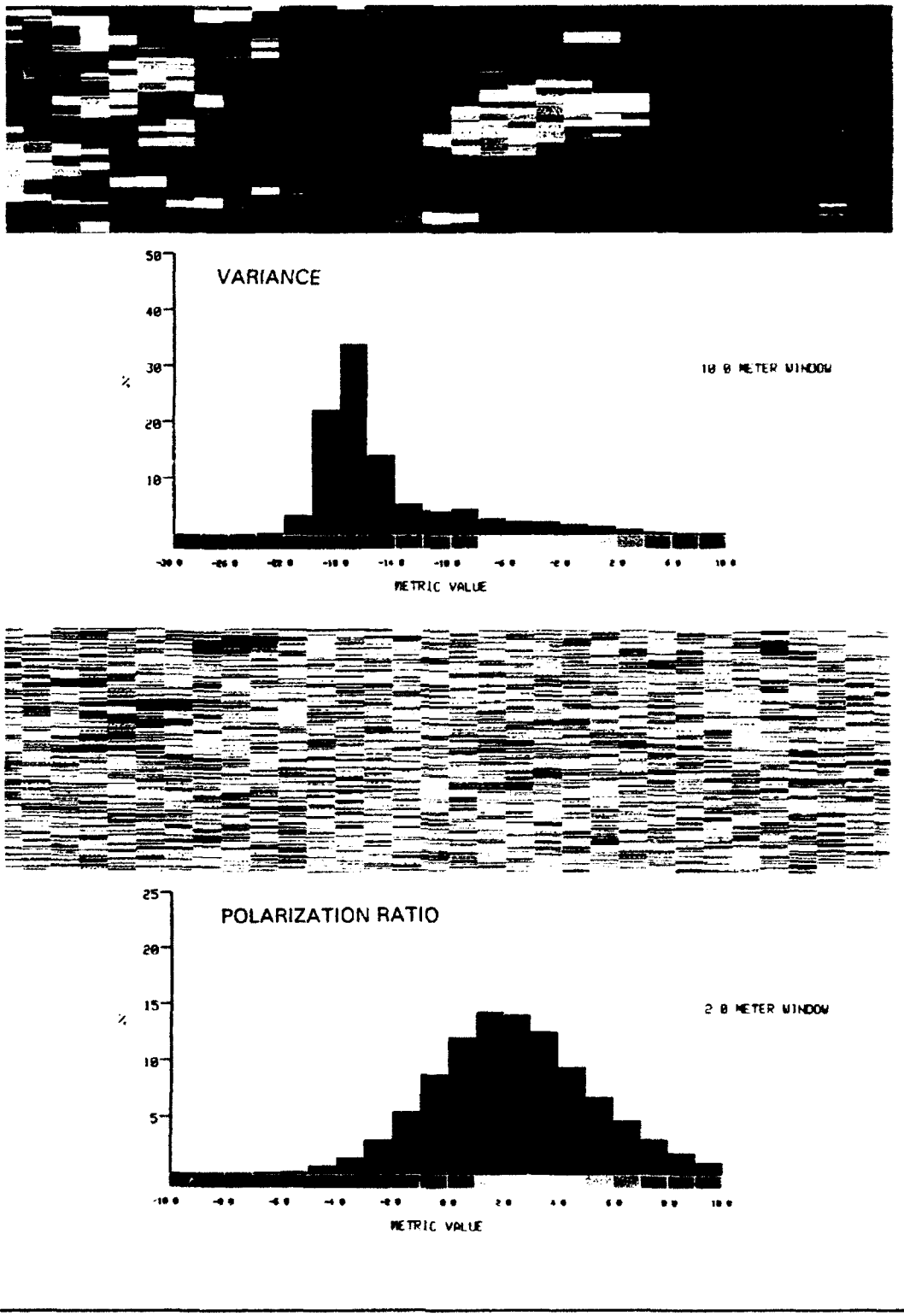
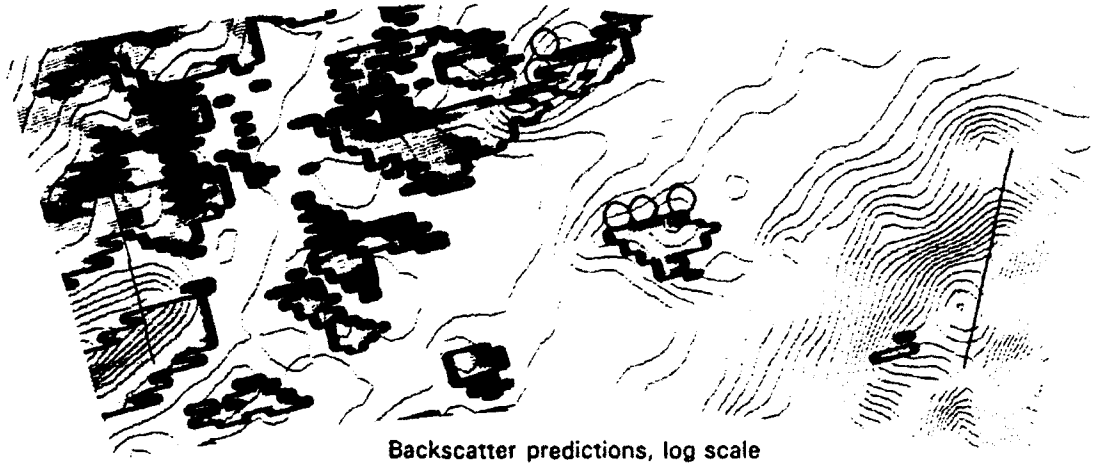
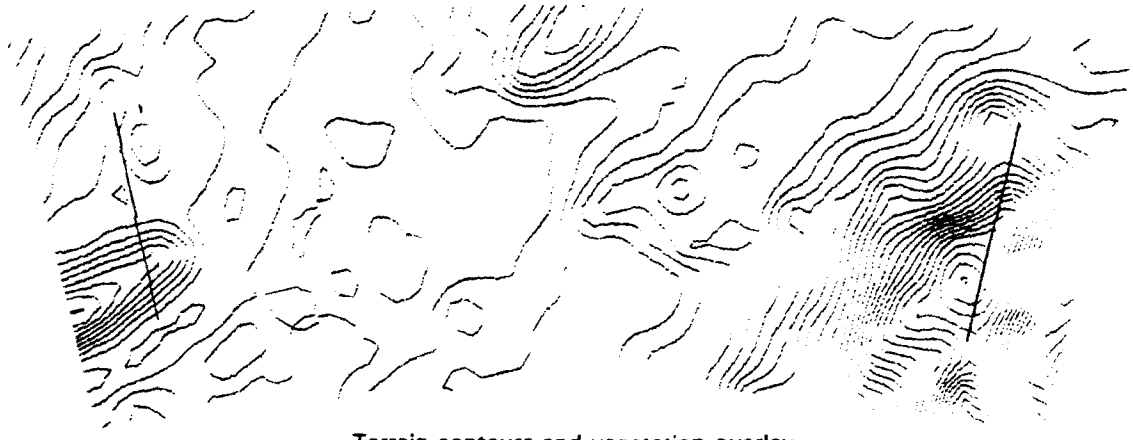


Figure C15. (Sheet 6 of 7)

Measured data, log scale



Backscatter predictions, log scale



Terrain contours and vegetation overlay

Figure C15. (Sheet 7 of 7)

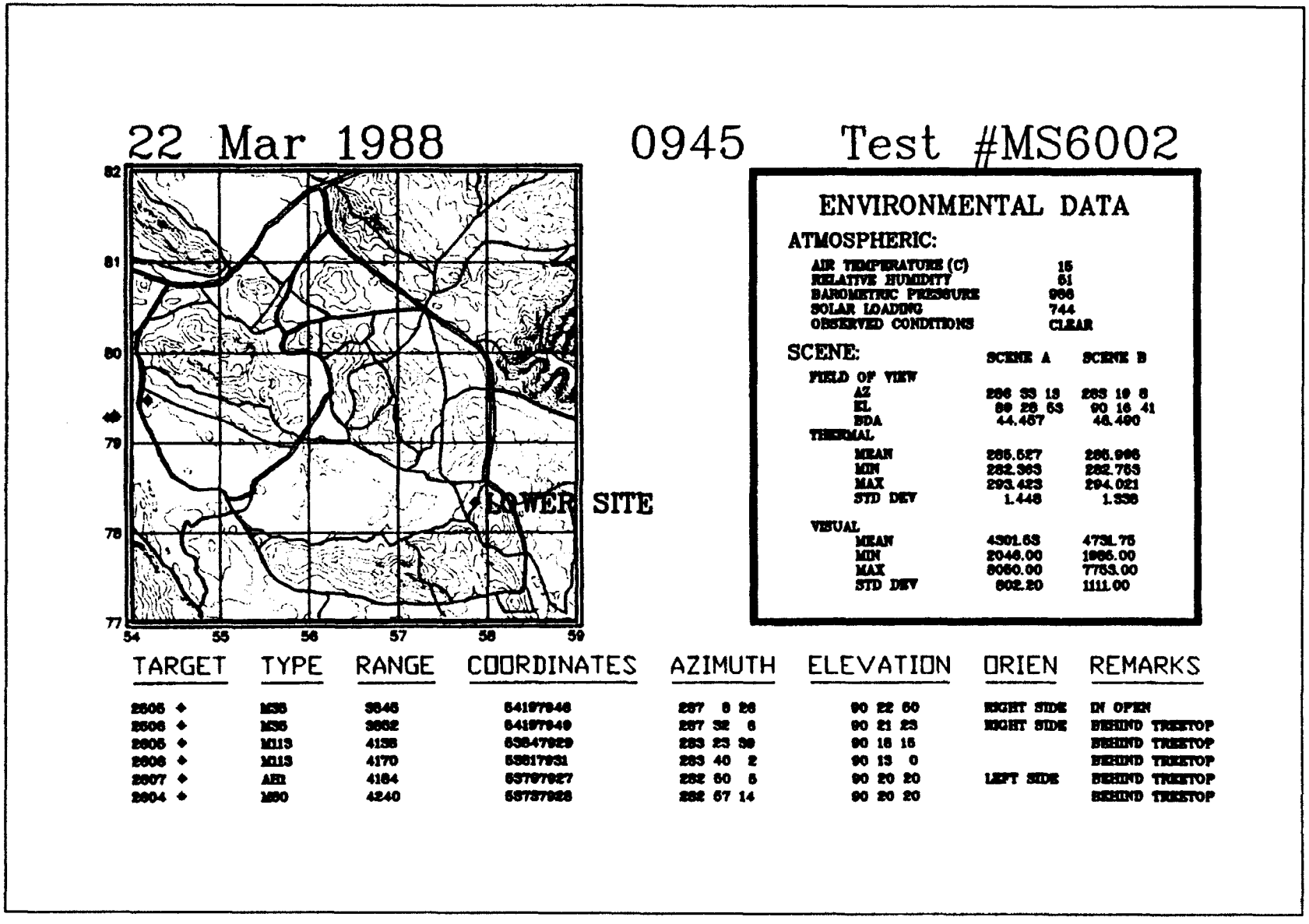


Figure C16. Summary data for MS6002 (Sheet 1 of 7)

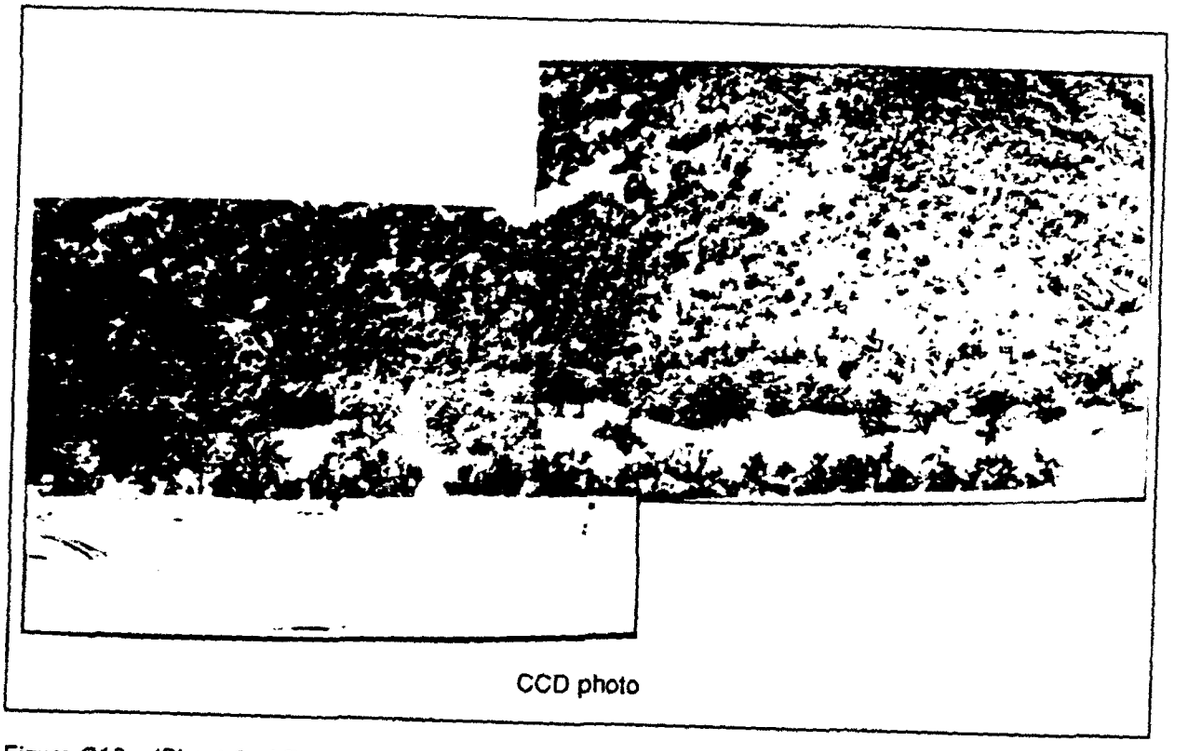


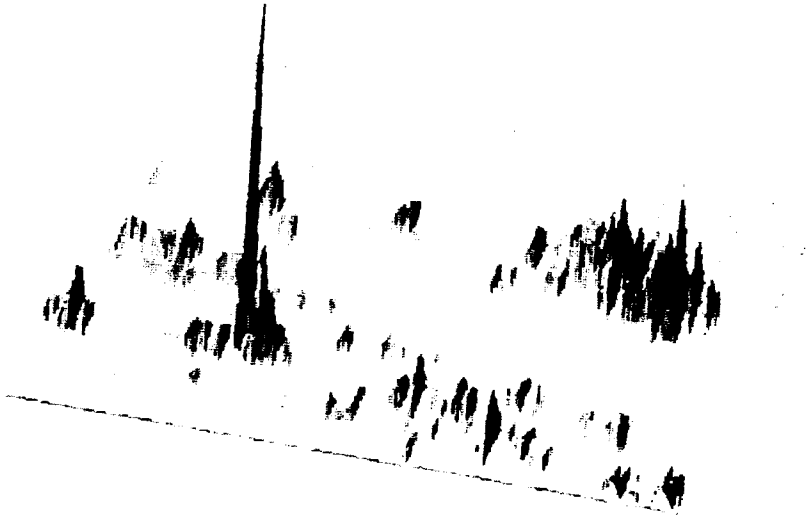
Figure C16. (Sheet 2 of 7)

Overhead photo

Terrain contours (10-ft interval)

Figure C16. (Sheet 3 of 7)

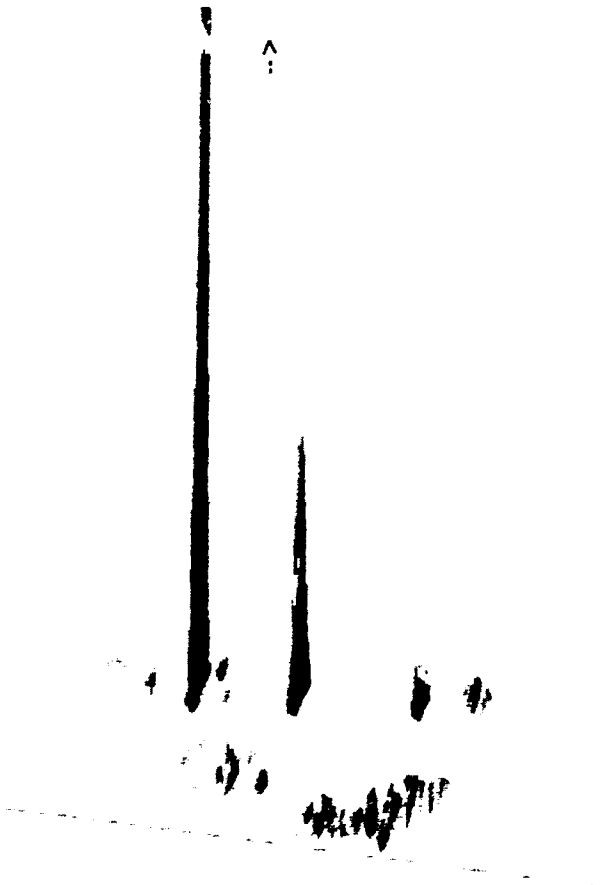
Measured data, linear scale



3-D plot of measured data, linear scale

Figure C16. (Sheet 4 of 7)

Measured data, linear scale



3-D plot of measured data, linear scale

Figure C16. (Sheet 5 of 7)

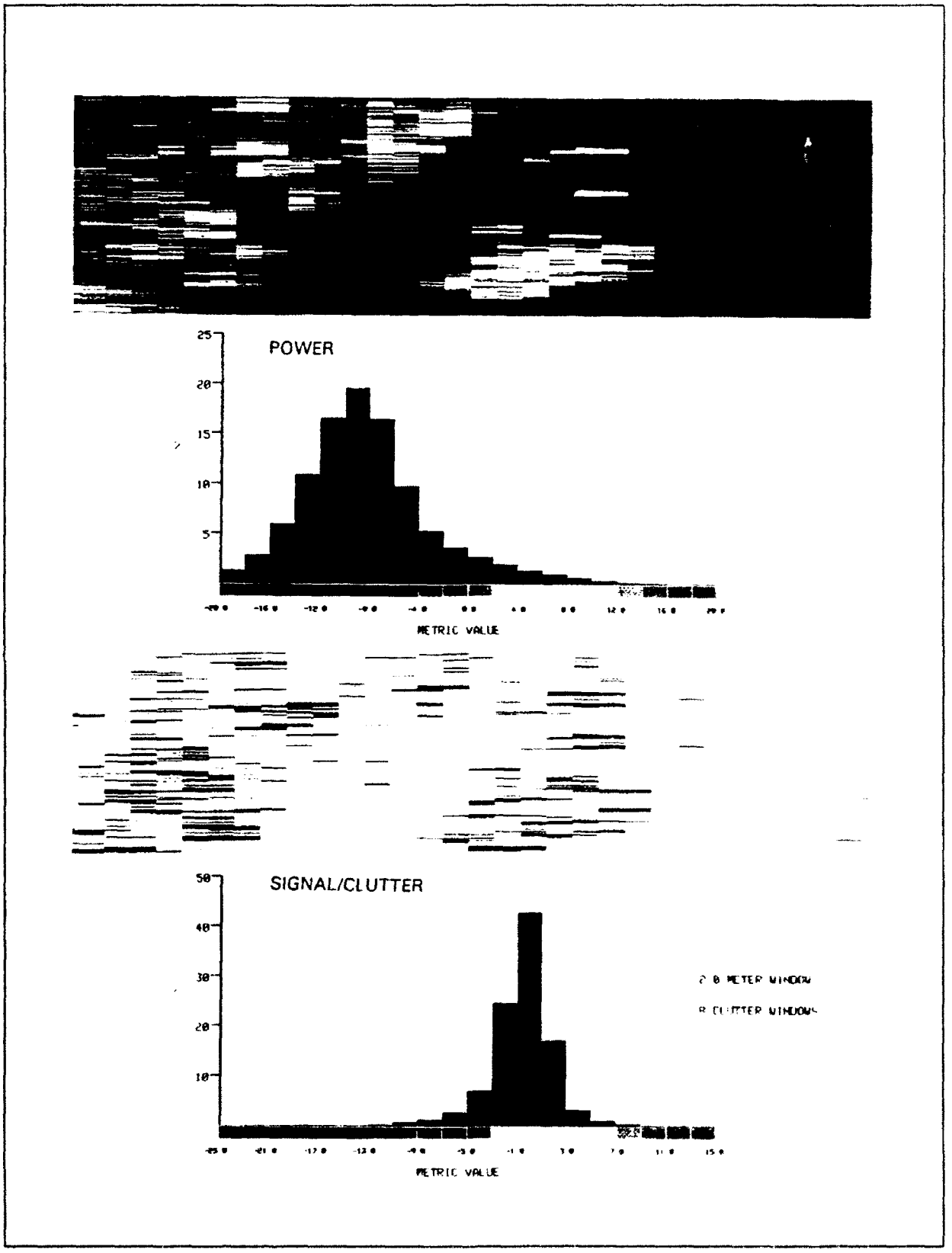
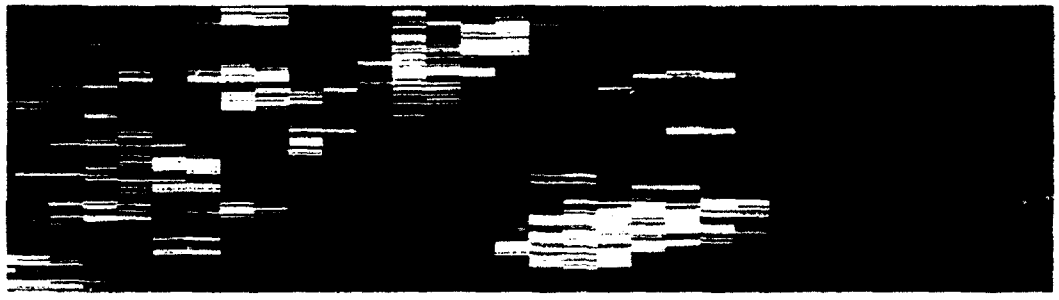
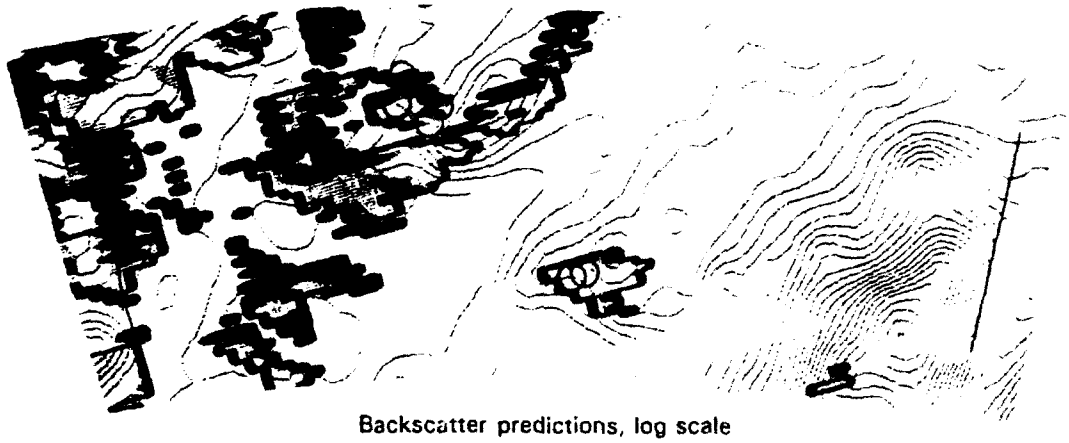


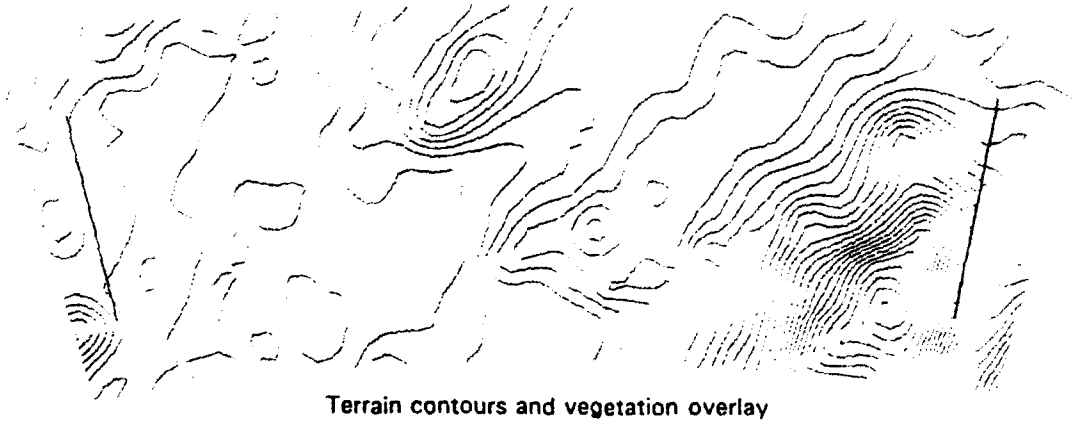
Figure C16. (Sheet 6 of 7)



Measured data, log scale



Backscatter predictions, log scale



Terrain contours and vegetation overlay

Figure C16. (Sheet 7 of 7)

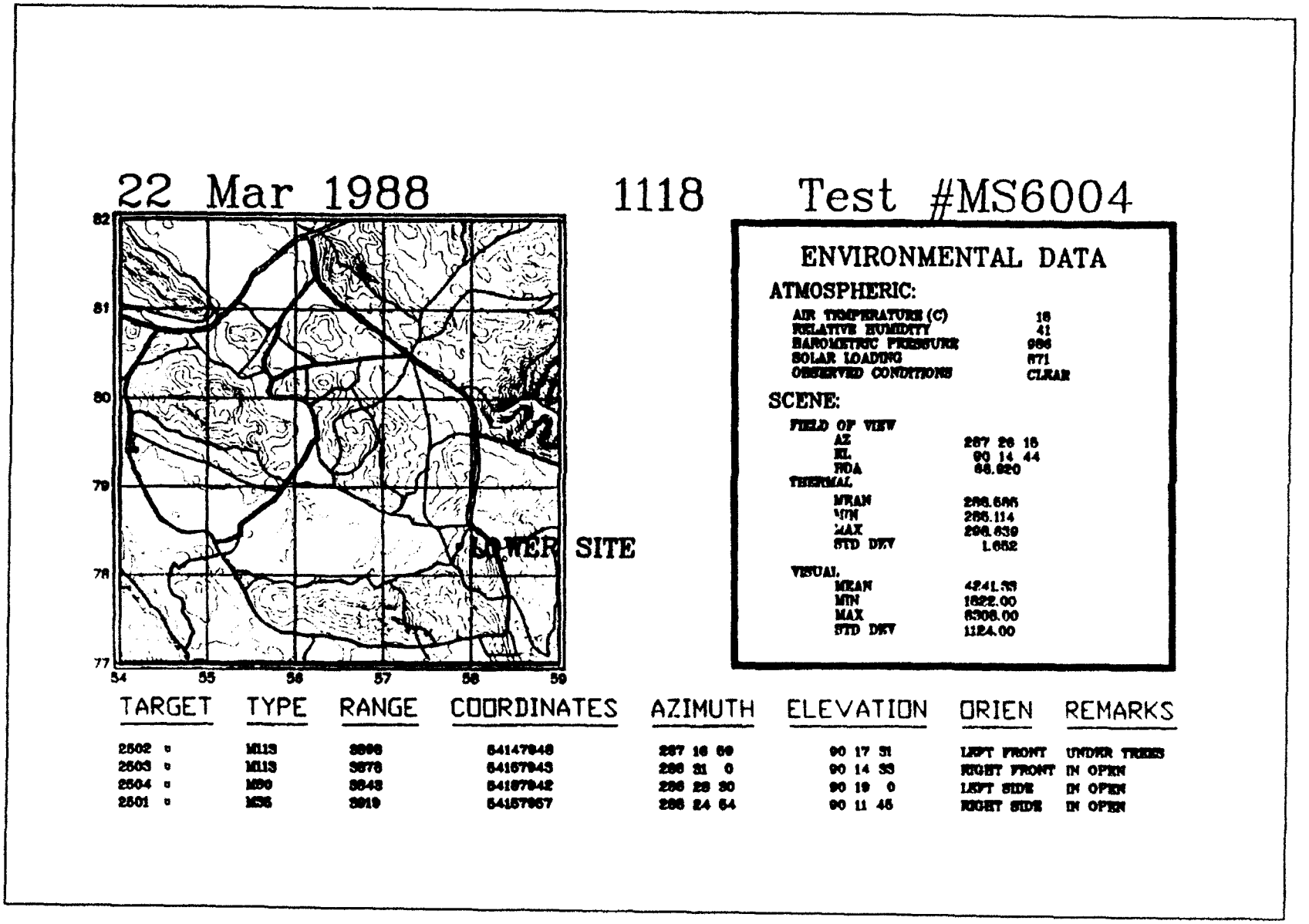


Figure C17. Summary data for MS6004 (Sheet 1 of 7)

CCD photo

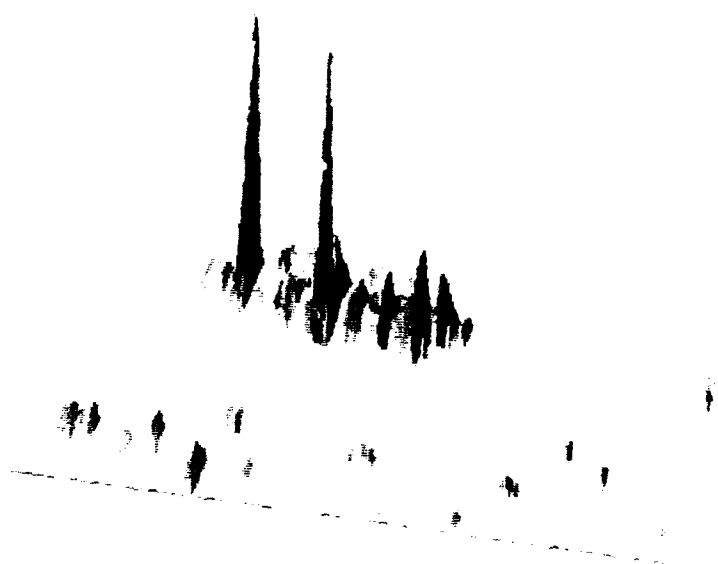
Figure C17. (Sheet 2 of 7)

Overhead photo

Terrain contours (10-ft interval)

Figure C17. (Sheet 3 of 7)

Measured data, linear scale



3-D plot of measured data, linear scale

Figure C17. (Sheet 4 of 7)

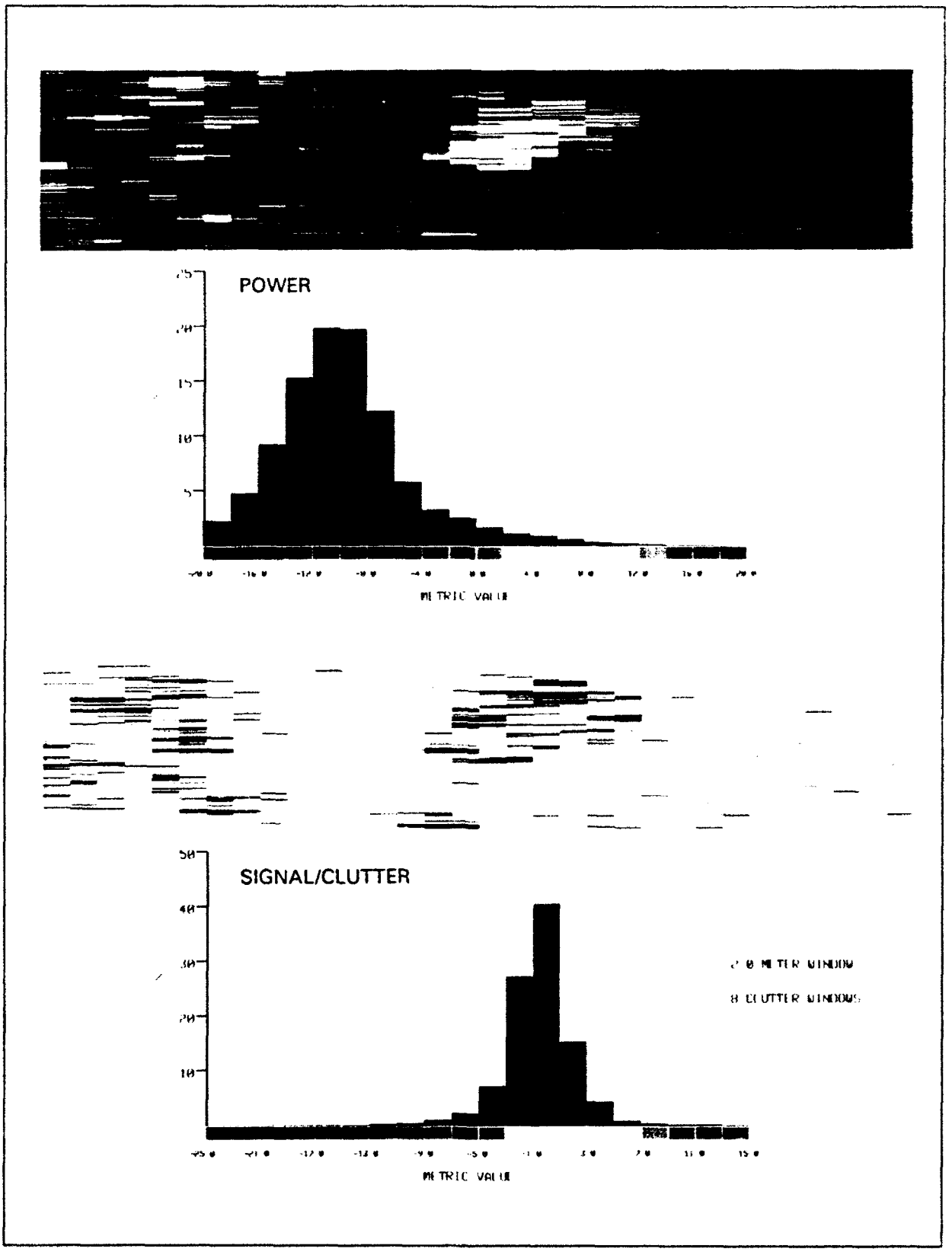


Figure C17. (Sheet 5 of 7)

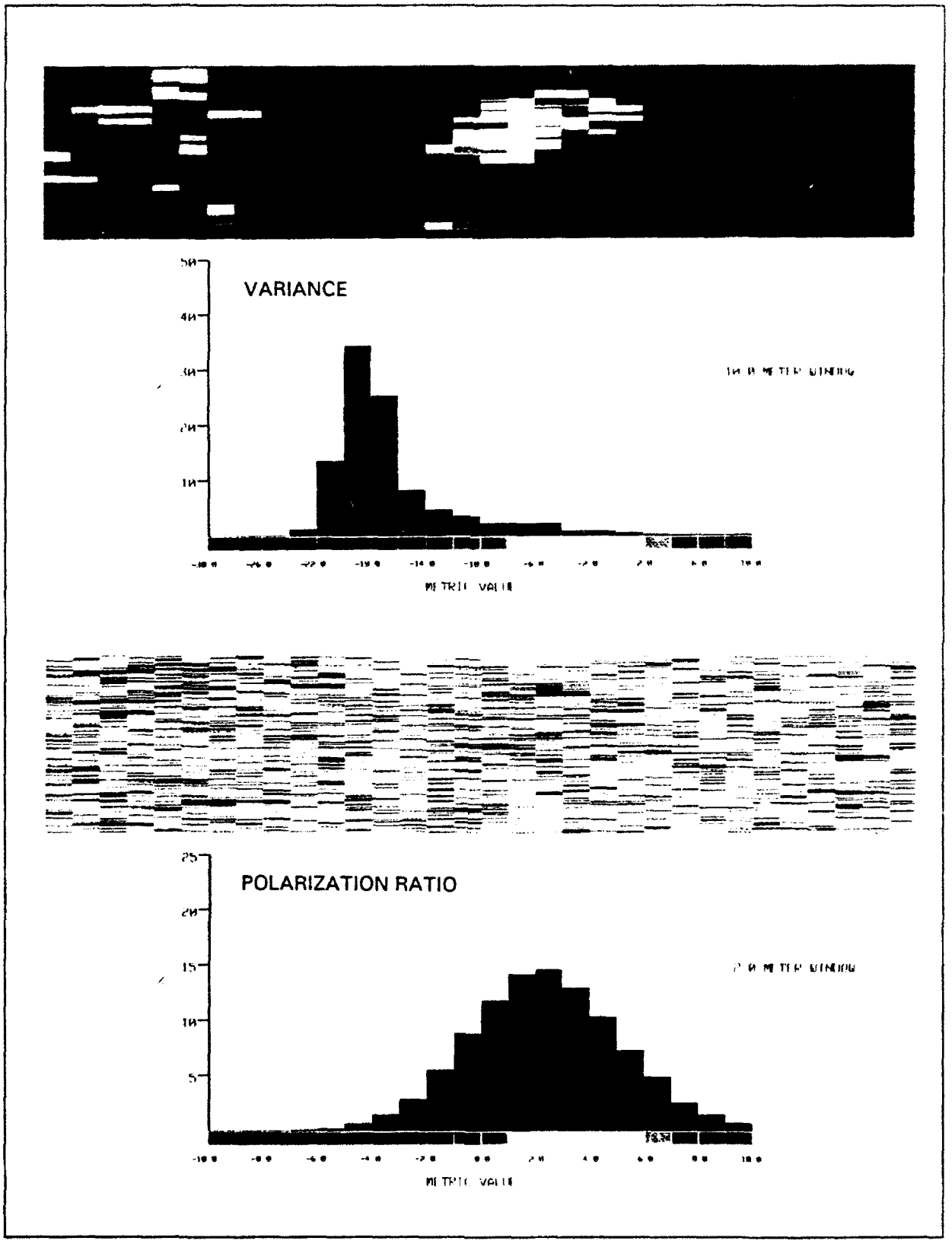
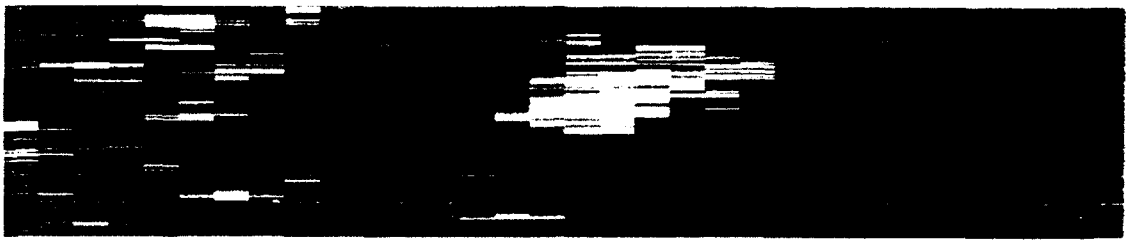
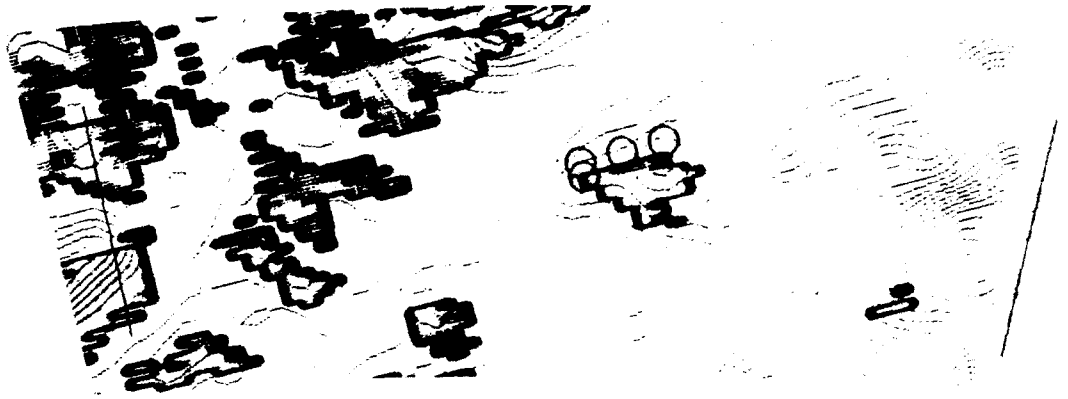


Figure C17. (Sheet 6 of 7)



Measured data, log scale

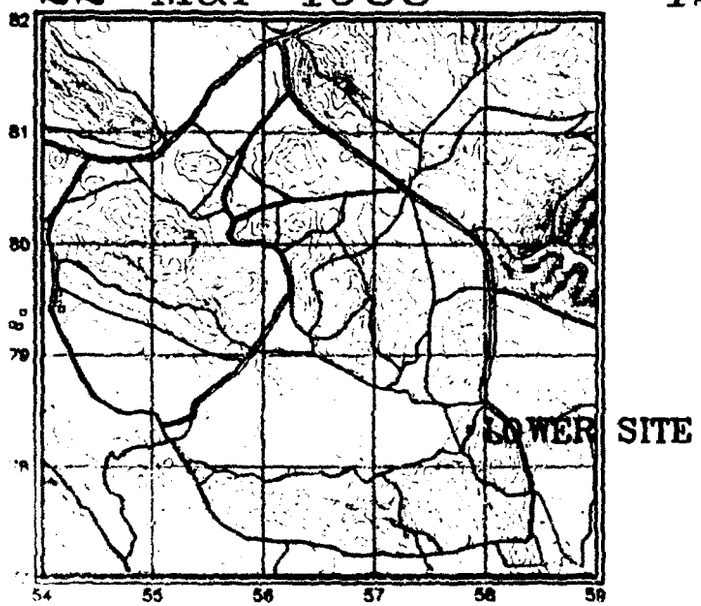


Backscatter predictions, log scale

Terrain contours and vegetation overlay

Figure C17. (Sheet 7 of 7)

22 Mar 1988 1230 Test #MS6101



ENVIRONMENTAL DATA

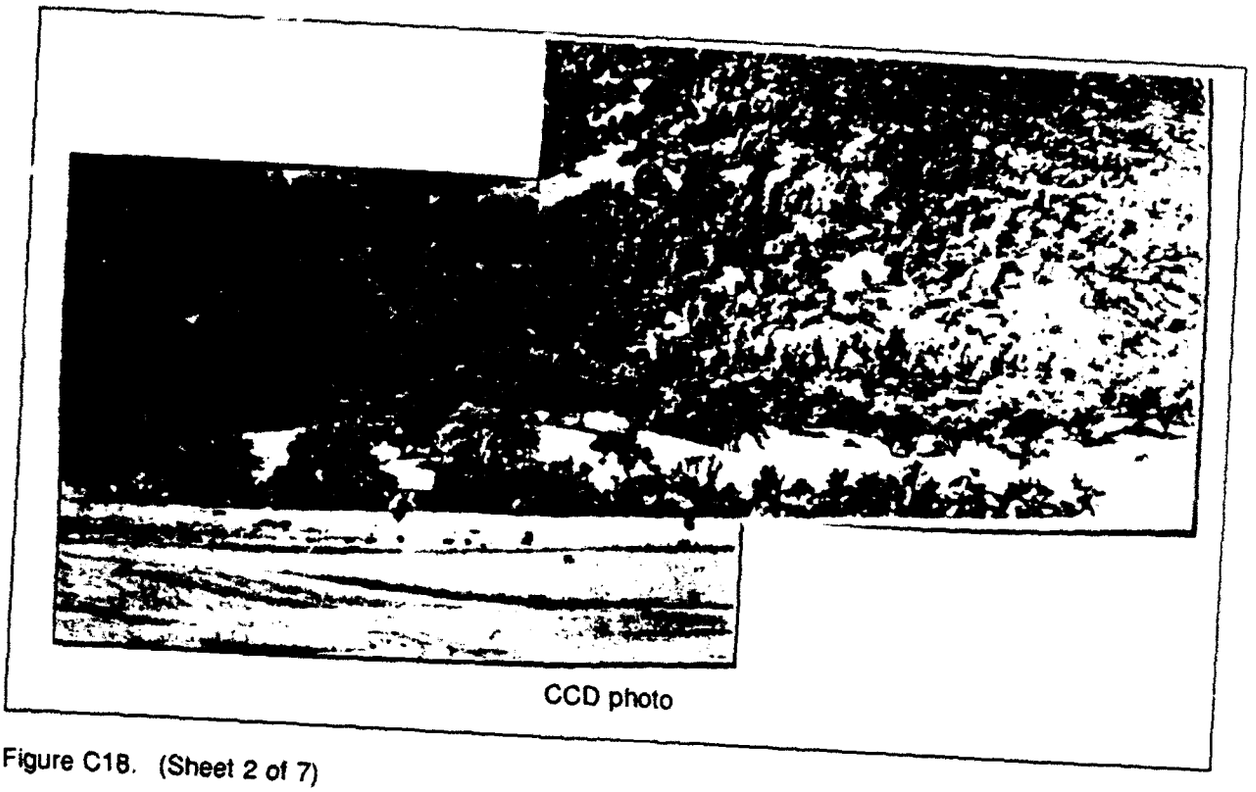
ATMOSPHERIC:

AIR TEMPERATURE (C)	20
RELATIVE HUMIDITY	34
BAROMETRIC PRESSURE	988
SOLAR LOADING	883
OBSERVED CONDITIONS	CLEAR

SCENE:	SCENE A	SCENE B
FIELD OF VIEW		
AZ	266 33 14	283 57 24
EL	89 28 48	90 15 9
HDA	64.151	66.358
THERMAL		
MEAN	290.109	290.585
MIN	286.656	287.486
MAX	298.189	300.390
STD DEV	1.165	1.069
VISUAL		
MEAN	3499.41	3758.26
MIN	1675.00	1534.00
MAX	7559.00	8588.00
STD DEV	706.20	935.70

TARGET	TYPE	RANGE	COORDINATES	AZIMUTH	ELEVATION	ORIEN	REMARKS
2604	M60	3643	54187942	286 29 9	90 19 27	LEFT SIDE	IN OPEN
2601	M60	3919	54157967	286 25 6	90 12 3	RIGHT SIDE	IN OPEN
2602	2S0	3696	54147948	287 16 31	90 16 57	LEFT FRONT	NEAR TREE
2602	M35	4169	53837939	284 46 57	90 10 53	RIGHT SIDE	BEHIND TREES
2604	M113	4240	53737928	282 55 47	90 20 57	LEFT SIDE	BEHIND TREETOP
2607	M35	4184	53797927	282 58 04	90 20 51	FRONT	BEHIND TREE

Figure C18. Summary data for MS6101 (Sheet 1 of 7)



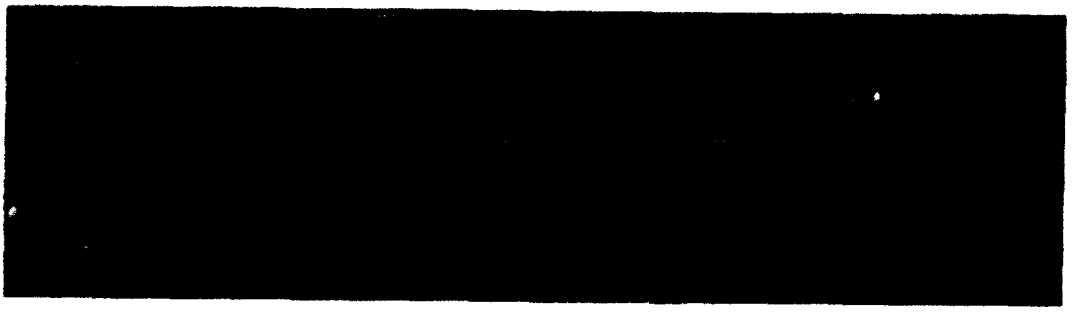
CCD photo

Figure C18. (Sheet 2 of 7)

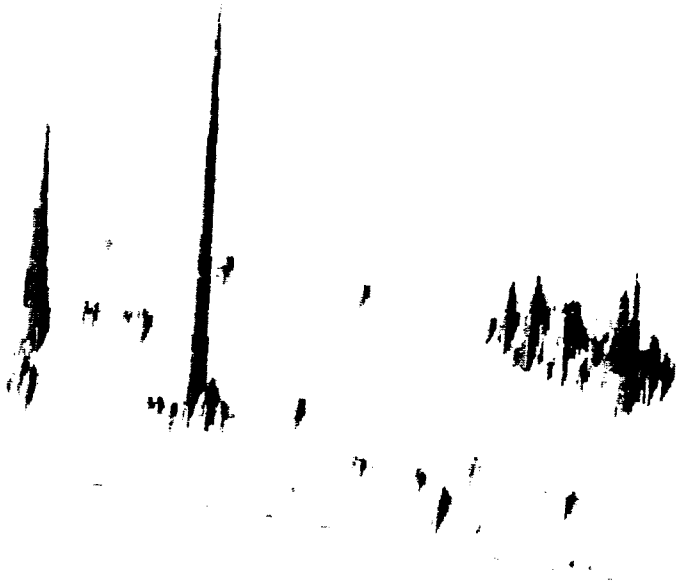
Overhead photo

Terrain contours (10-ft interval)

Figure C18. (Sheet 3 of 7)



Measured data, linear scale



3-D plot of measured data, linear scale

Figure C18. (Sheet 4 of 7)

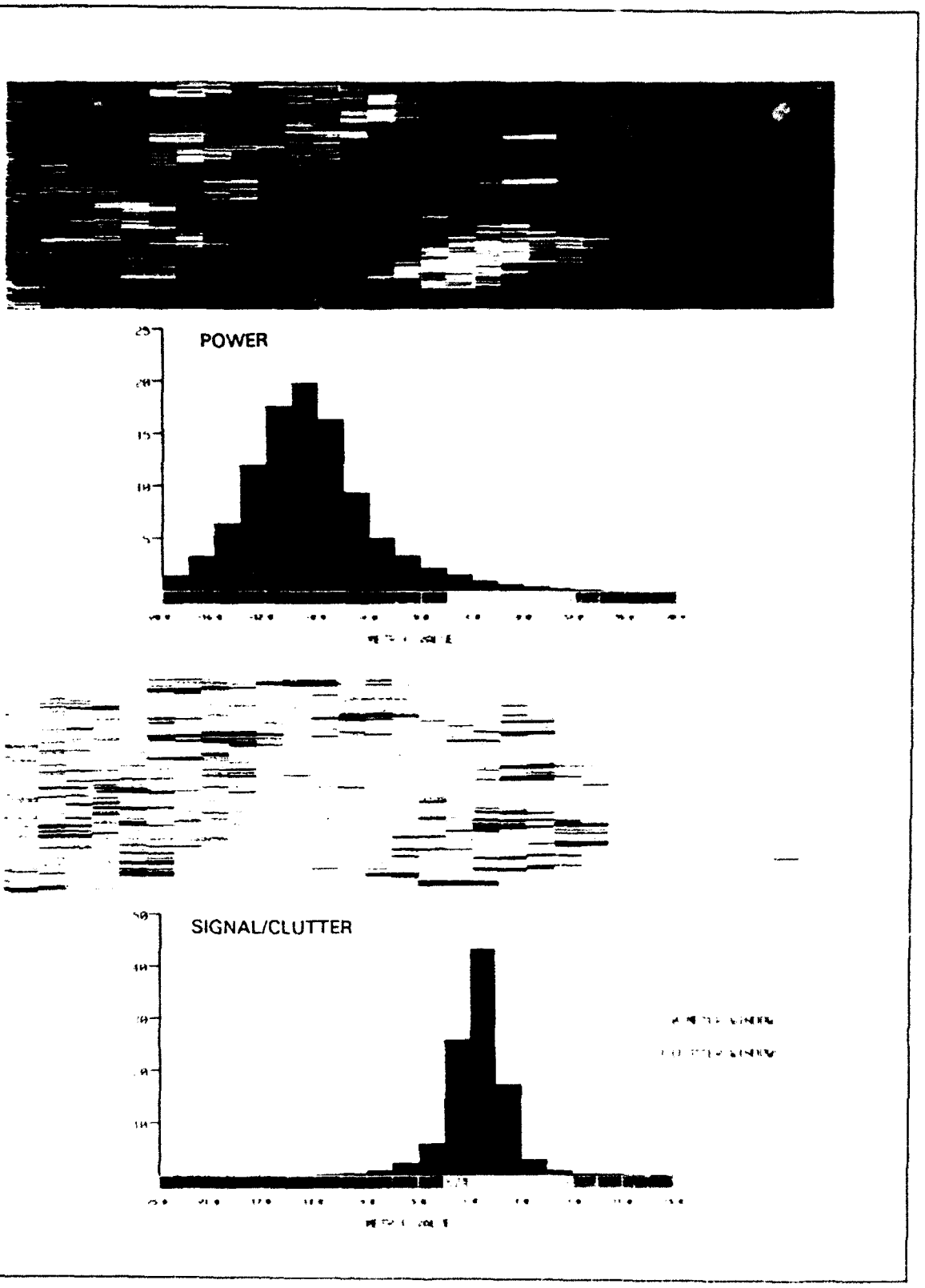
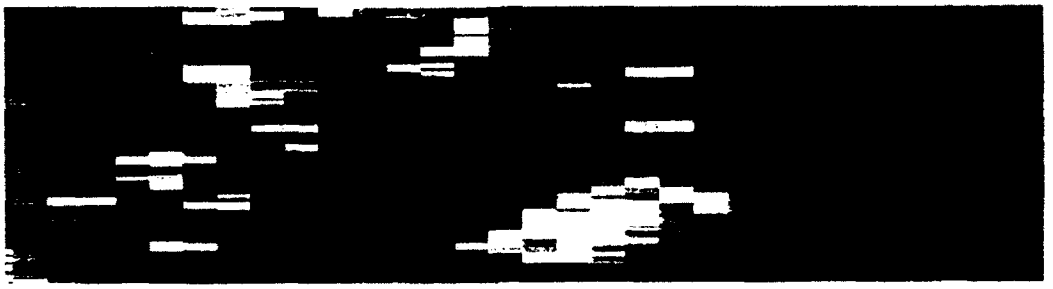
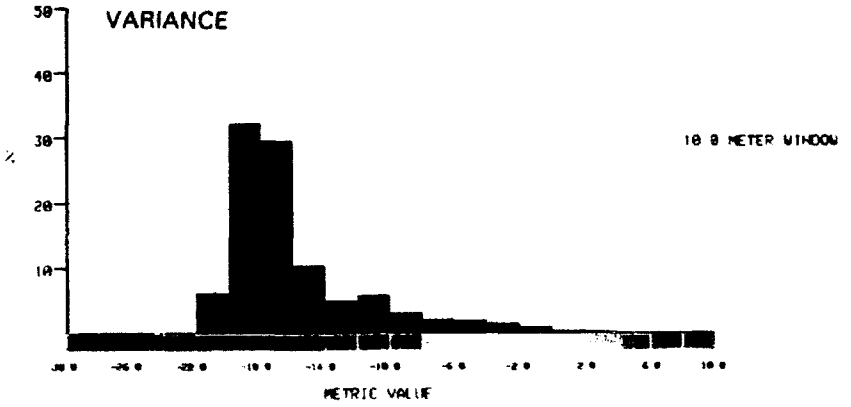


Figure C18 (Sheet 5 of 7)





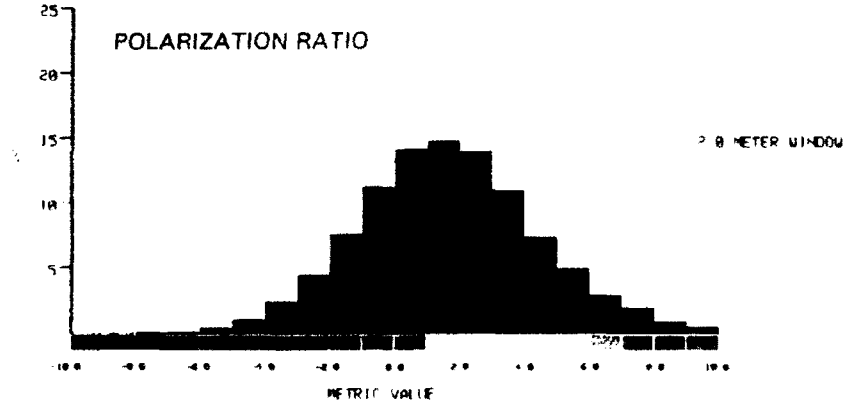
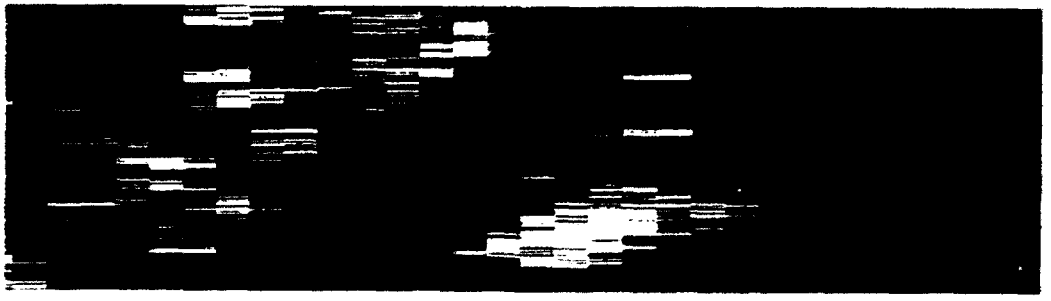
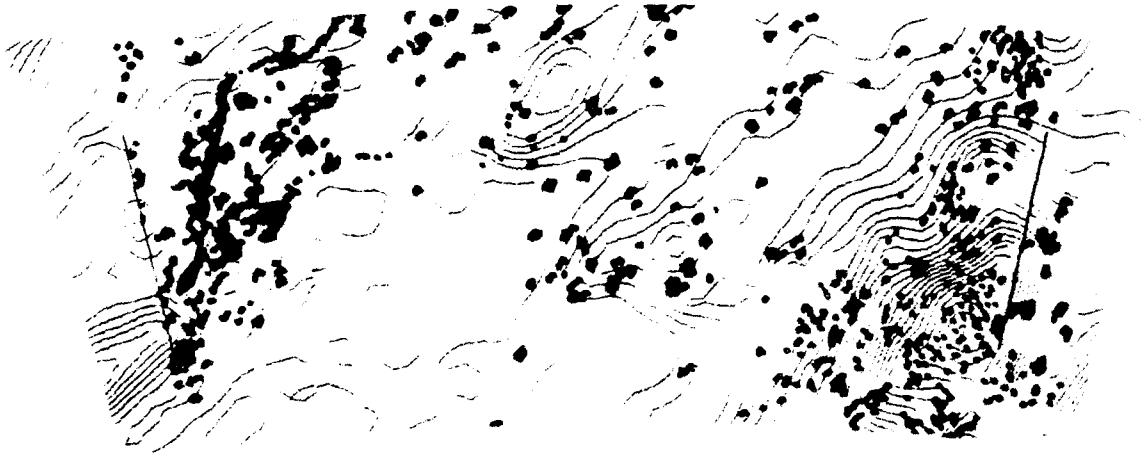


Figure C18. (Sheet 6 of 7)



Measured data, log scale

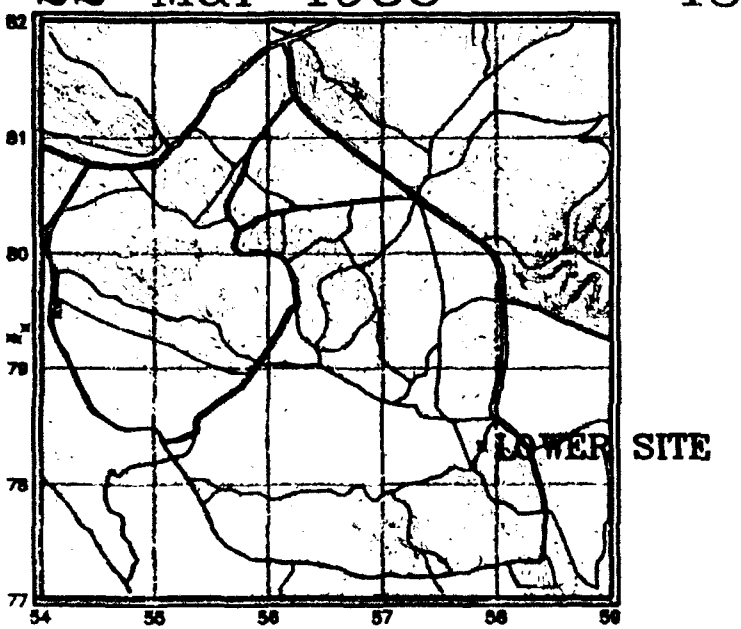
Backscatter predictions, log scale



Terrain contours and vegetation overlay

Figure C18. (Sheet 7 of 7)

22 Mar 1988 1311 Test #MS6102



ENVIRONMENTAL DATA

ATMOSPHERIC:

AIR TEMPERATURE (C)	20
RELATIVE HUMIDITY	14
BAROMETRIC PRESSURE	986
SOLAR LOADING	903
OBSERVED CONDITIONS	CLEAR

SCENE:	SCENE A	SCENE B
FIELD OF VIEW		
AZ	286 15 1	283 44 5
EL	89 28 4	90 15 28
RDA	94.280	96.440
THERMAL		
MEAN	299.843	290.611
MIN	296.425	286.866
MAX	296.508	300.362
STD DEV	1.184	1.184
VISUAL		
MEAN	3611.46	3611.41
MIN	1763.00	1646.00
MAX	8687.00	7537.00
STD DEV	641.80	896.40

TARGET	TYPE	RANGE	COORDINATES	AZIMUTH	ELEVATION	ORIEN	REMARKS
2502 M	M13	3886	54147946	287 15 30	90 16 51	FRONT	IN TREES
2601 M	M13	4142	53967937	284 31 23	90 11 47	LEFT FRONT	BEHIND TREETOP
2607 M	M60	4184	53797927	282 59 9	90 20 48	RIGHT FRONT	BEHIND TREETOP
2604 M	M26	4240	53737925	282 57 9	90 19 51	LEFT SIDE	BEHIND M60
2501 A	2SU	3919	54167957	286 24 8	90 17 26	LEFT SIDE	OBSERVED LOC

Figure C19. Summary data for MS6102 (Sheet 1 of 7)

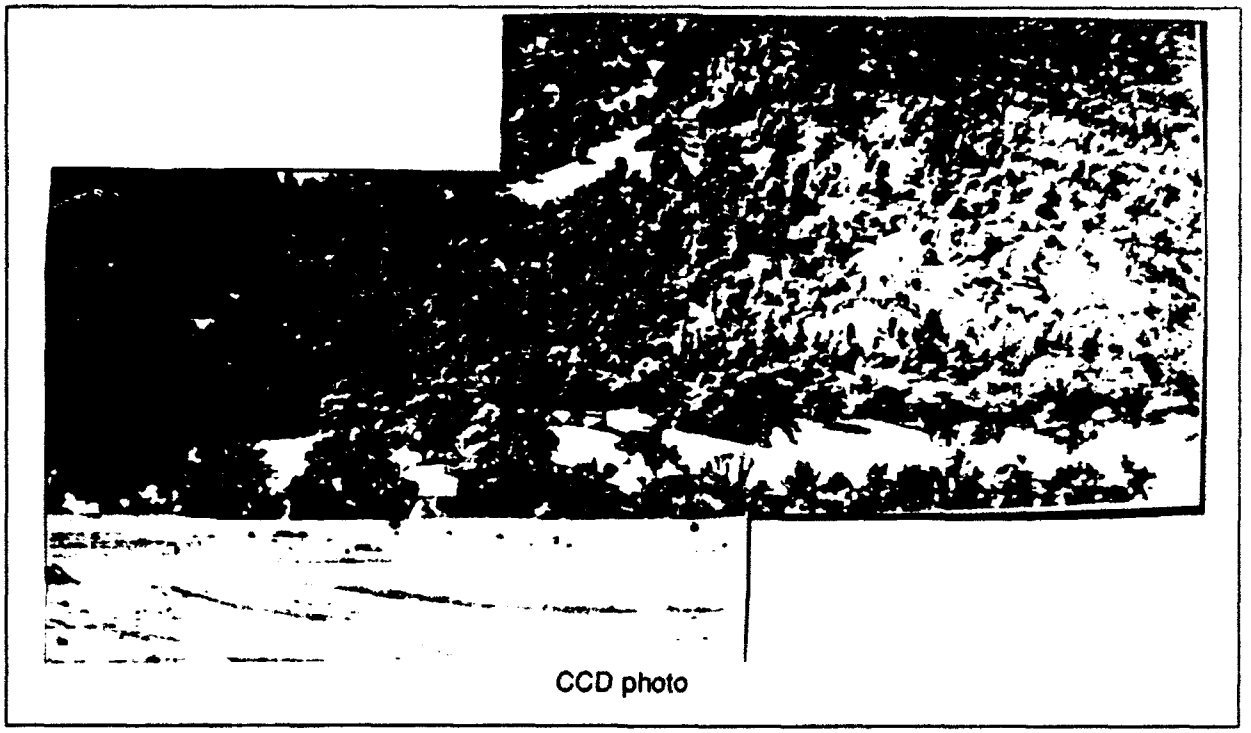


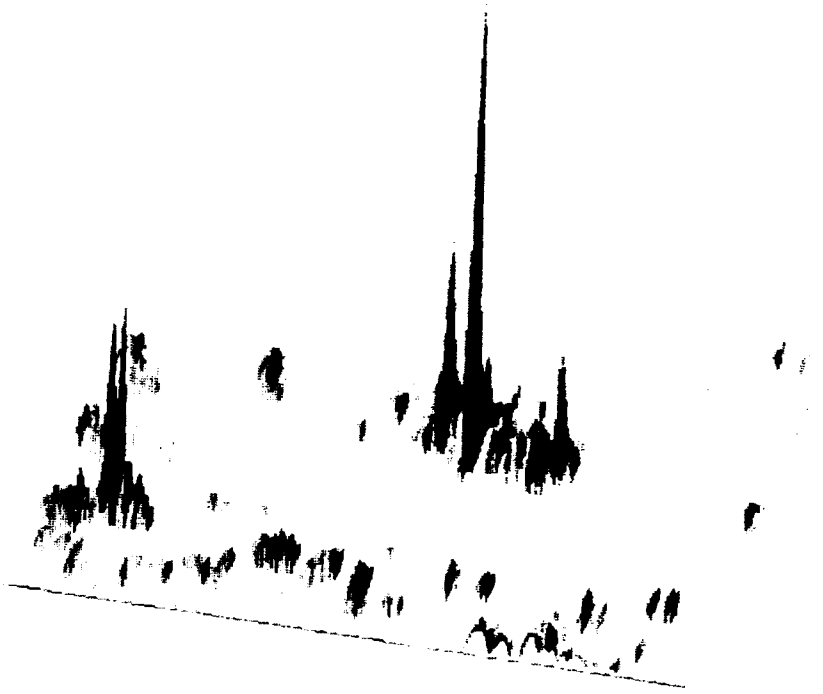
Figure C19. (Sheet 2 of 7)

Overhead photo

Terrain contours (10-ft interval)

Figure C19. (Sheet 3 of 7)

Measured data, linear scale



3-D plot of measured data, linear scale

Figure C19. (Sheet 4 of 7)

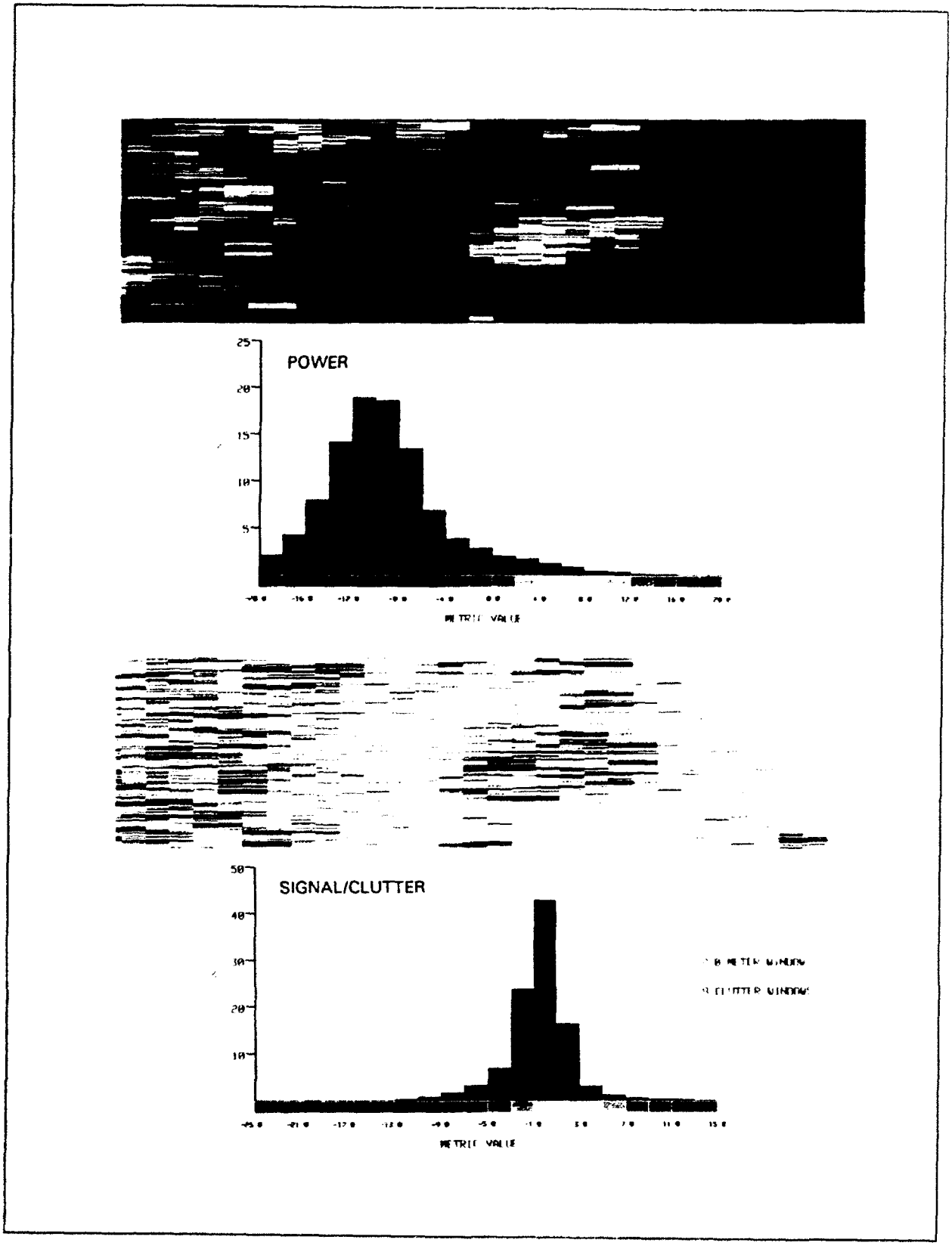


Figure C19. (Sheet 5 of 7)

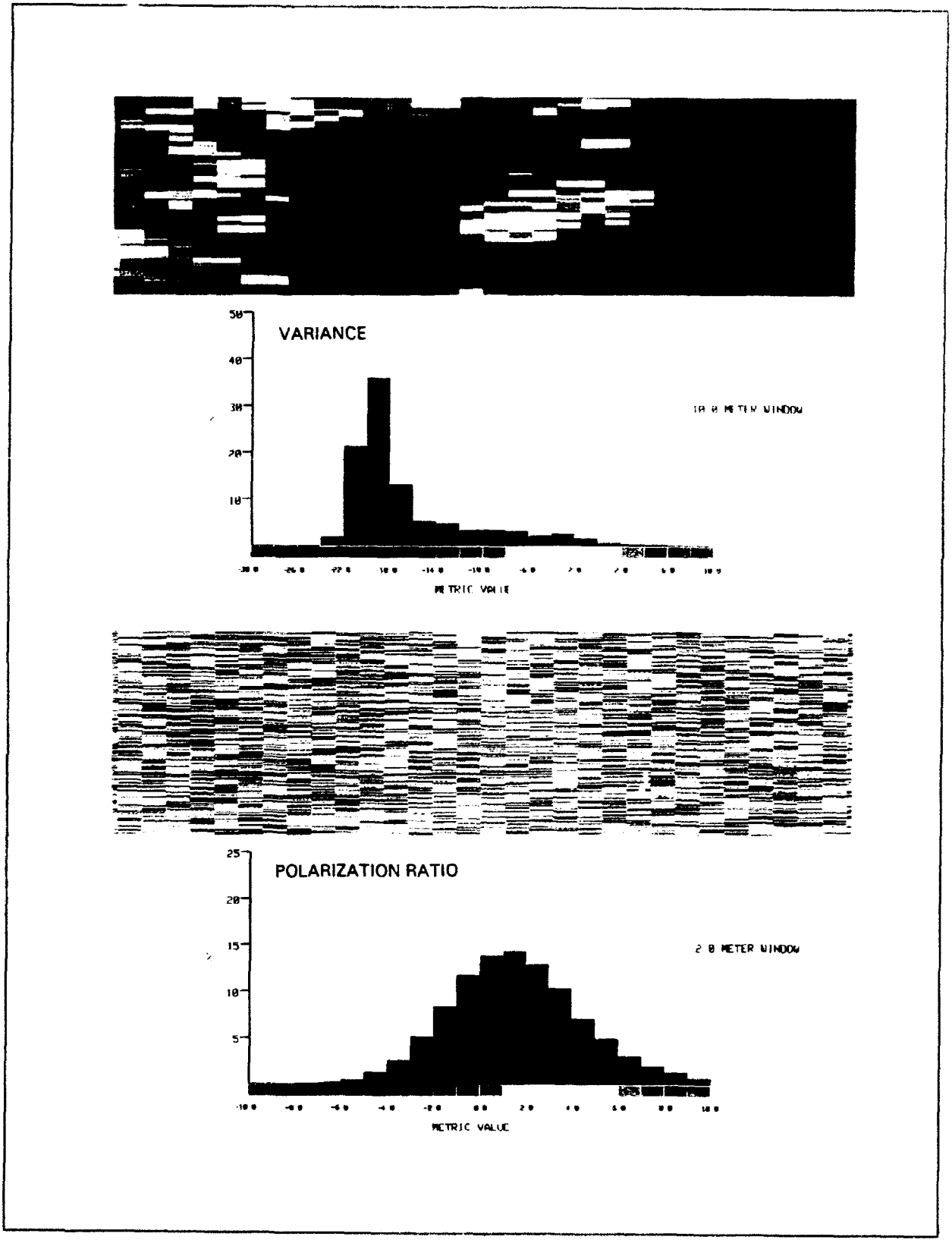
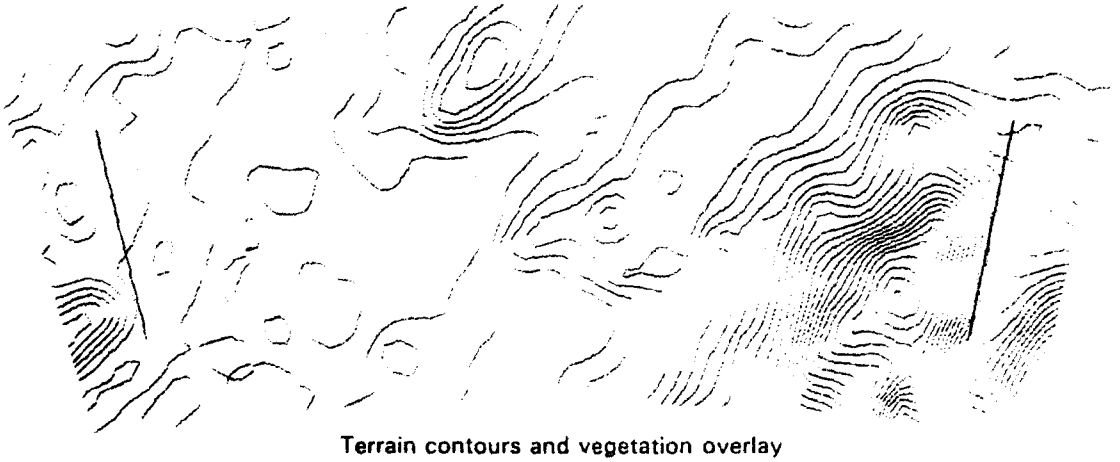


Figure C19. (Sheet 6 of 7)

Measured data, log scale

Backscatter predictions, log scale



Terrain contours and vegetation overlay

Figure C19. (Sheet 7 of 7)

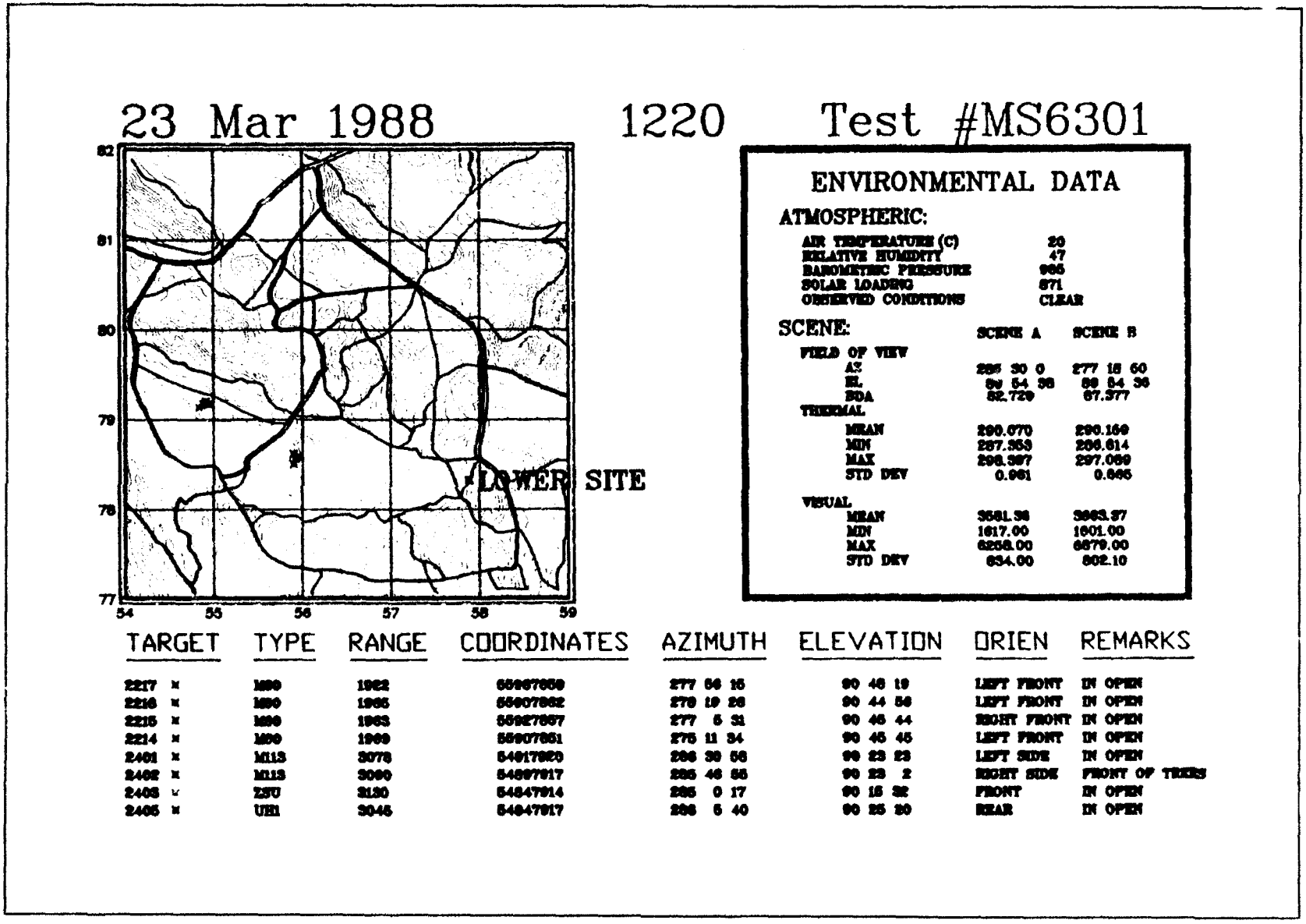
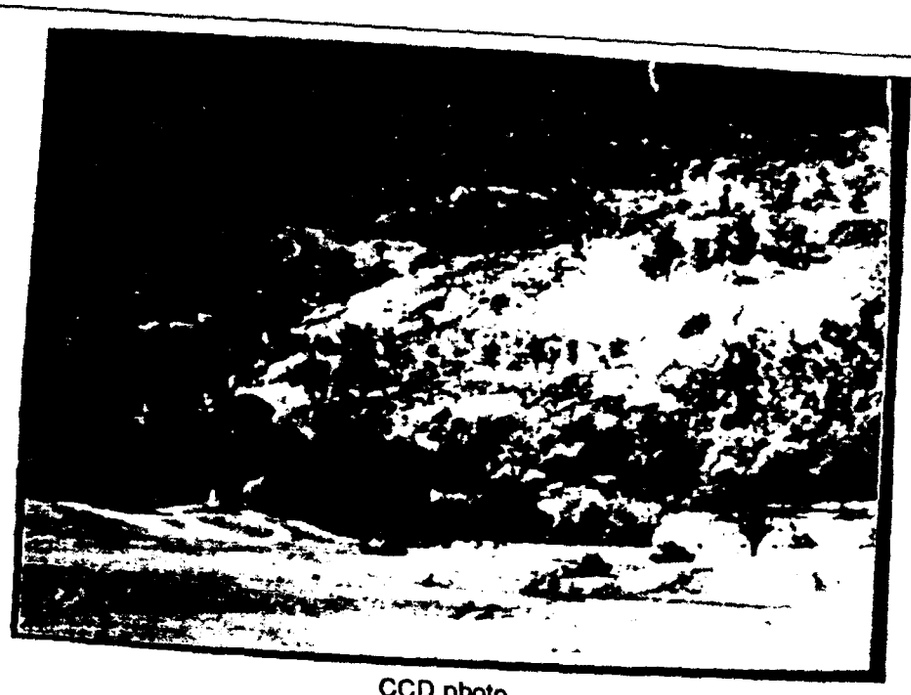


Figure C20. Summary data for MS6301 Short Range (Sheet 1 of 7)



CCD photo

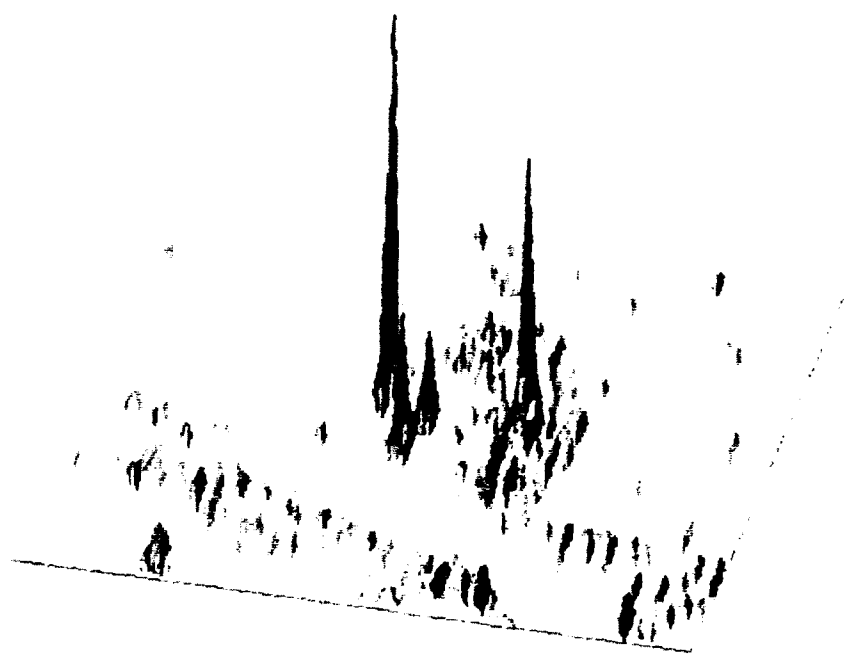
Figure C20. (Sheet 2 of 7)

Overhead photo

Terrain contours (10-ft interval)

Figure C20. (Sheet 3 of 7)

Measured data, linear scale



3-D plot of measured data, linear scale

Figure C20. (Sheet 4 of 7)

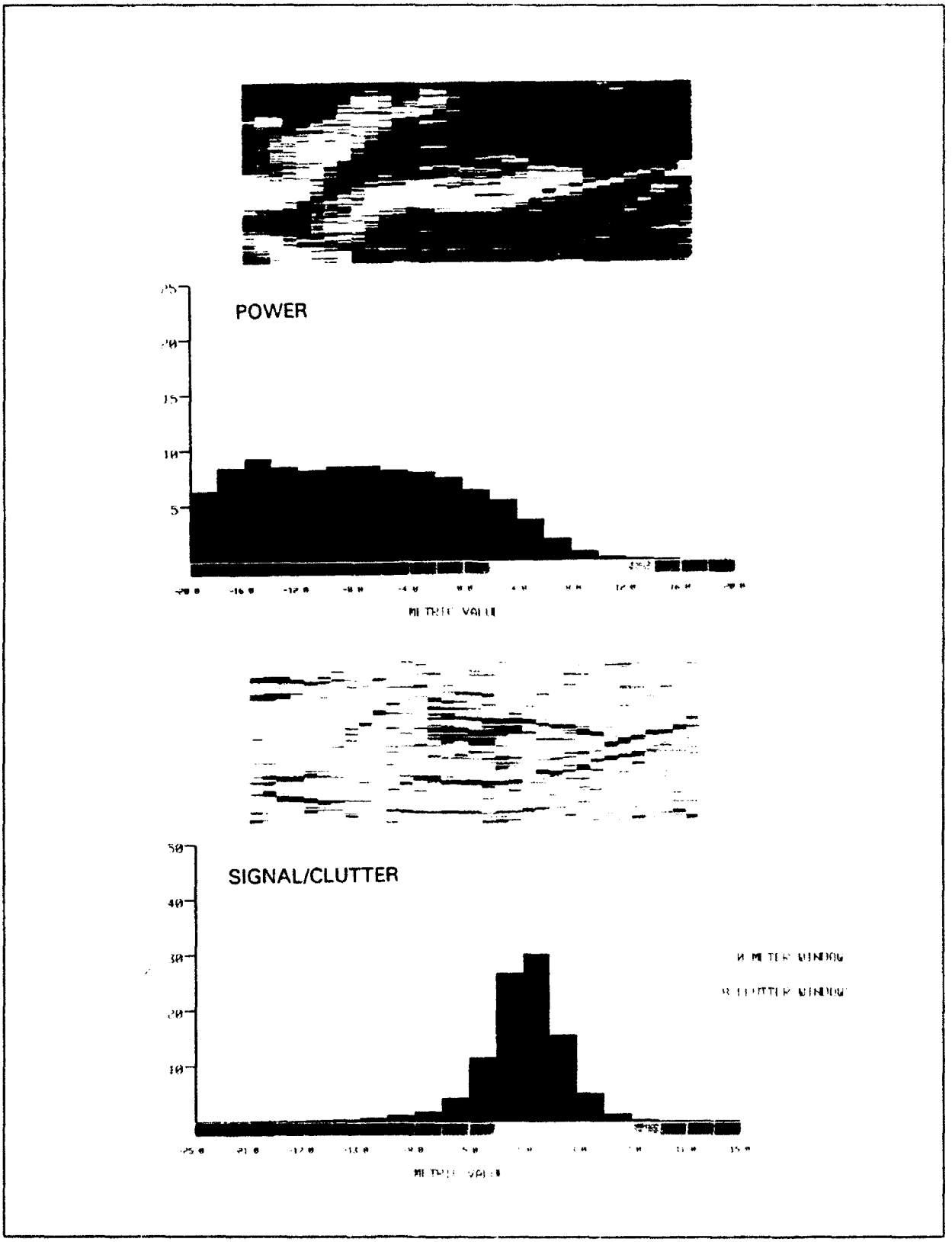


Figure C20. (Sheet 5 of 7)

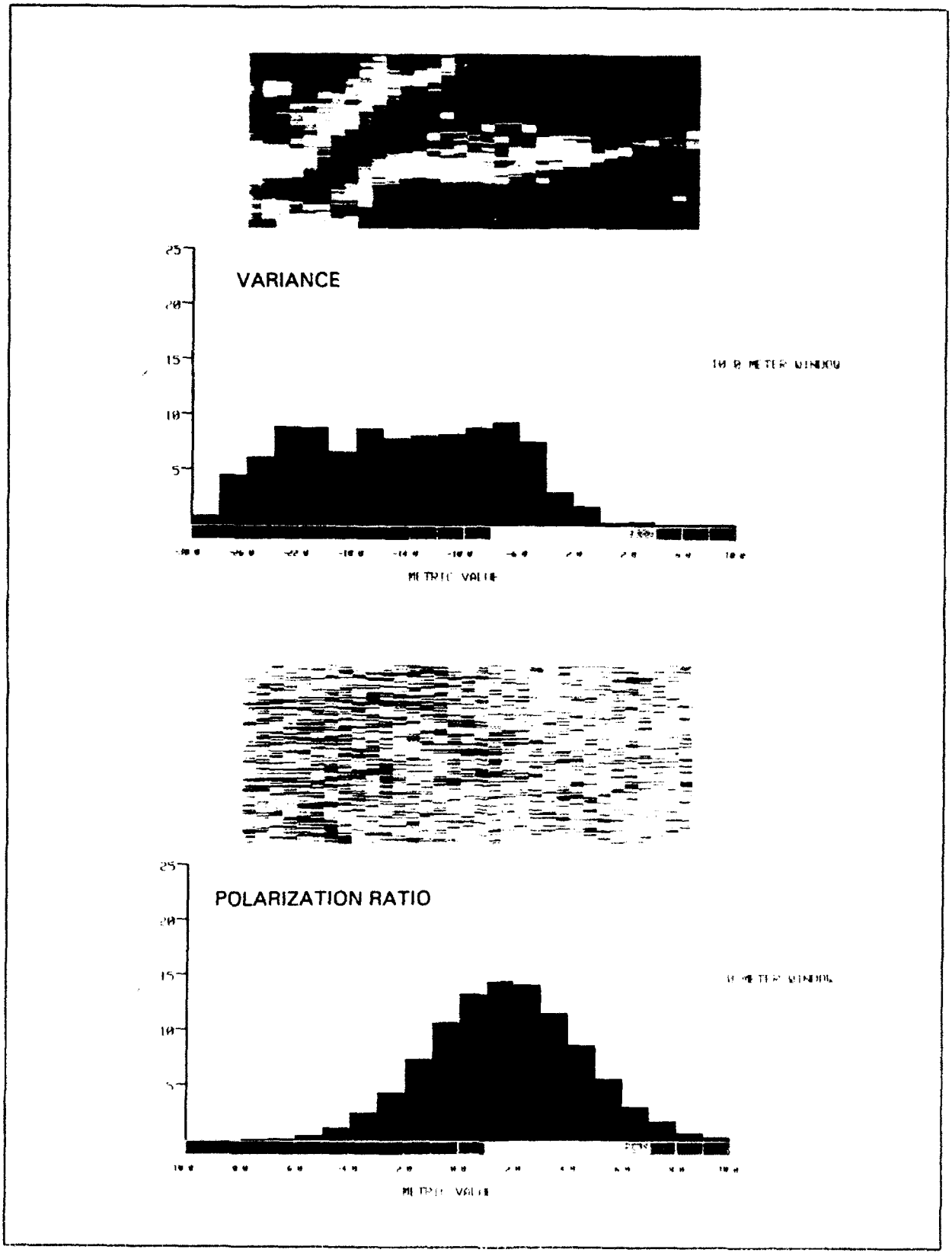
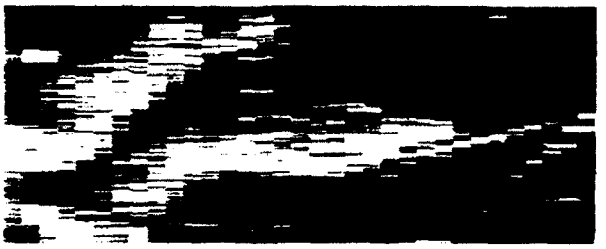


Figure C20. (Sheet 6 of 7)

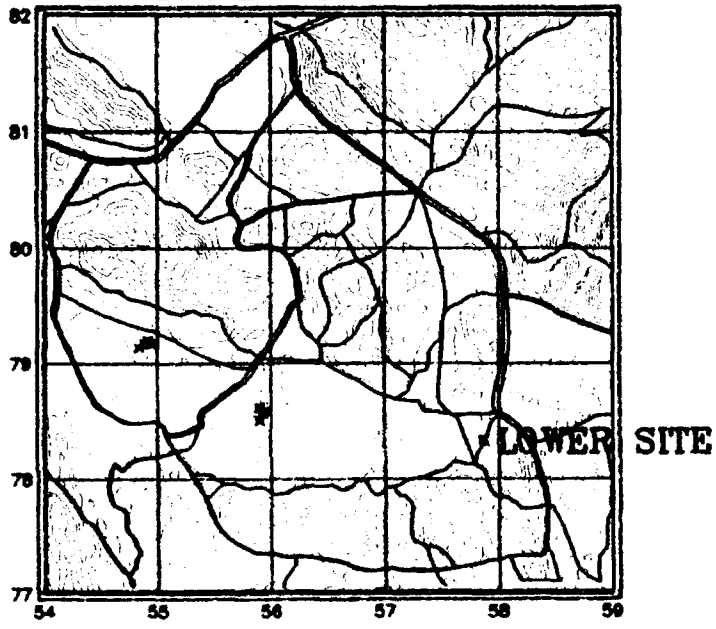


Measured data, log scale

Backscatter predictions, log scale

Terrain contours and vegetation overlay

Figure C20. (Sheet 7 of 7)



ENVIRONMENTAL DATA

ATMOSPHERIC:

AIR TEMPERATURE (C)	20
RELATIVE HUMIDITY	47
BAROMETRIC PRESSURE	966
SOLAR LOADING	671
OBSERVED CONDITIONS	CLEAR

SCENE:	SCENE A	SCENE B
FIELD OF VIEW		
AZ	295 30 0	277 18 50
EL	69 54 38	69 54 38
EDA	82.729	97.377
THERMAL		
MEAN	290.070	290.159
MIN	287.353	286.614
MAX	293.397	297.086
STD DEV	0.991	0.996
VISUAL		
MEAN	3581.36	3663.37
MIN	1617.00	1001.00
MAX	6256.00	6979.00
STD DEV	834.00	802.10

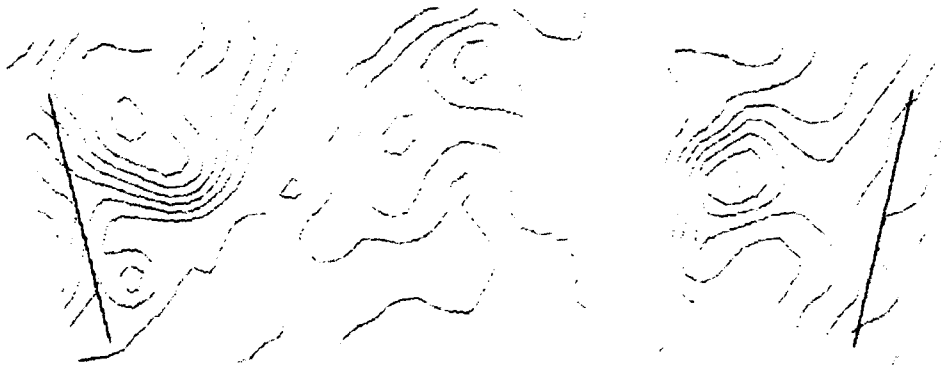
TARGET	TYPE	RANGE	COORDINATES	AZIMUTH	ELEVATION	ORIEN	REMARKS
2217 M	M60	1922	55007869	277 56 15	90 48 19	LEFT FRONT	IN OPEN
2216 M	M60	1906	55007862	278 19 28	90 44 56	LEFT FRONT	IN OPEN
2215 M	M60	1903	55027857	277 5 31	90 46 44	RIGHT FRONT	IN OPEN
2214 M	M60	1909	55007851	276 11 34	90 46 45	LEFT FRONT	IN OPEN
2401 M	M113	3078	54917920	296 30 56	90 23 23	LEFT SIDE	IN OPEN
2402 M	M113	3060	54897917	295 46 55	90 23 2	RIGHT SIDE	FRONT OF TREES
2403 -	ZSU	3130	54847914	295 0 17	90 15 32	FRONT	IN OPEN
2405 M	UH1	3045	54847917	296 5 40	90 25 20	REAR	IN OPEN

Figure C21. Summary data for MS6301 Long Range (Sheet 1 of 7)

CCD photo

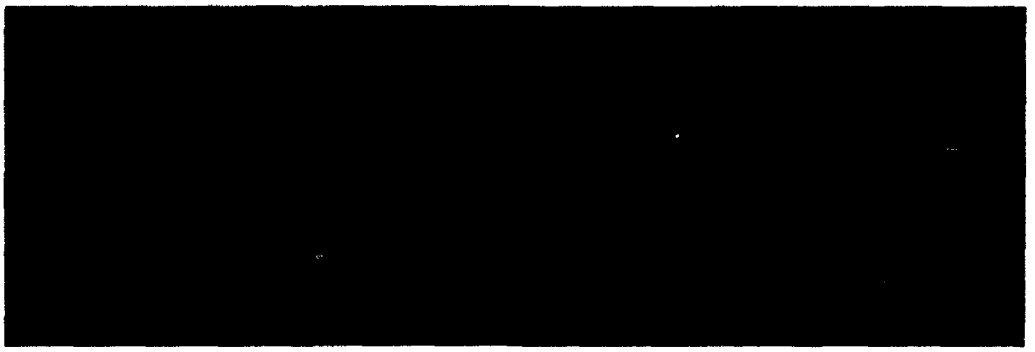
Figure C21. (Sheet 2 of 7)

Overhead photo

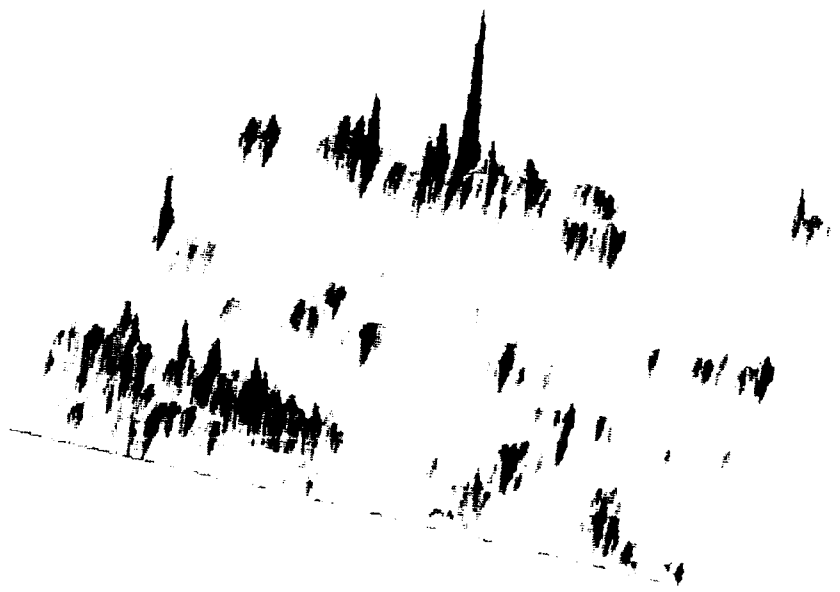


Terrain contours (10-ft interval)

Figure C21. (Sheet 3 of 7)



Measured data, linear scale



3-D plot of measured data, linear scale

Figure C21 (Sheet 4 of 7)

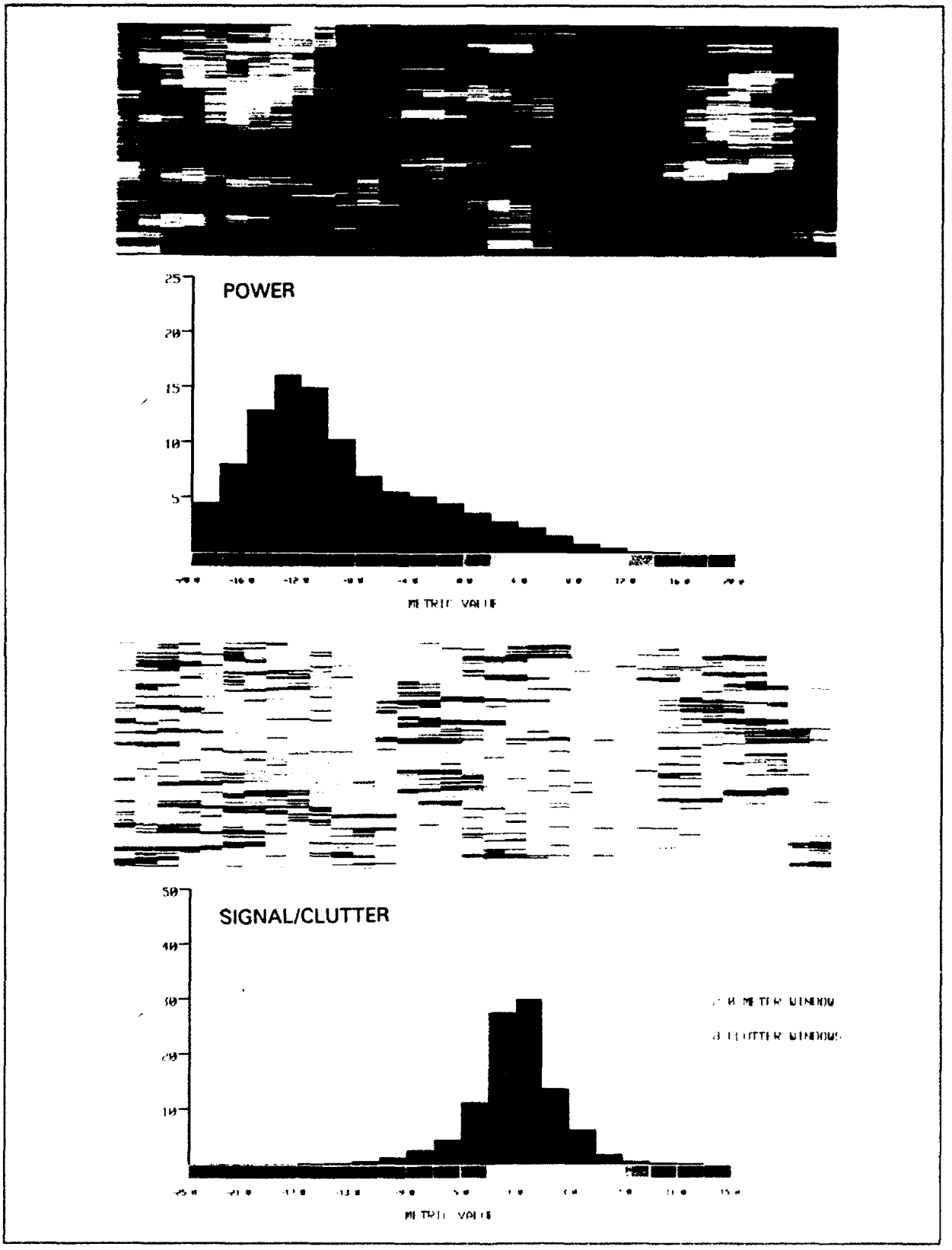


Figure C21. (Sheet 5 of 7)

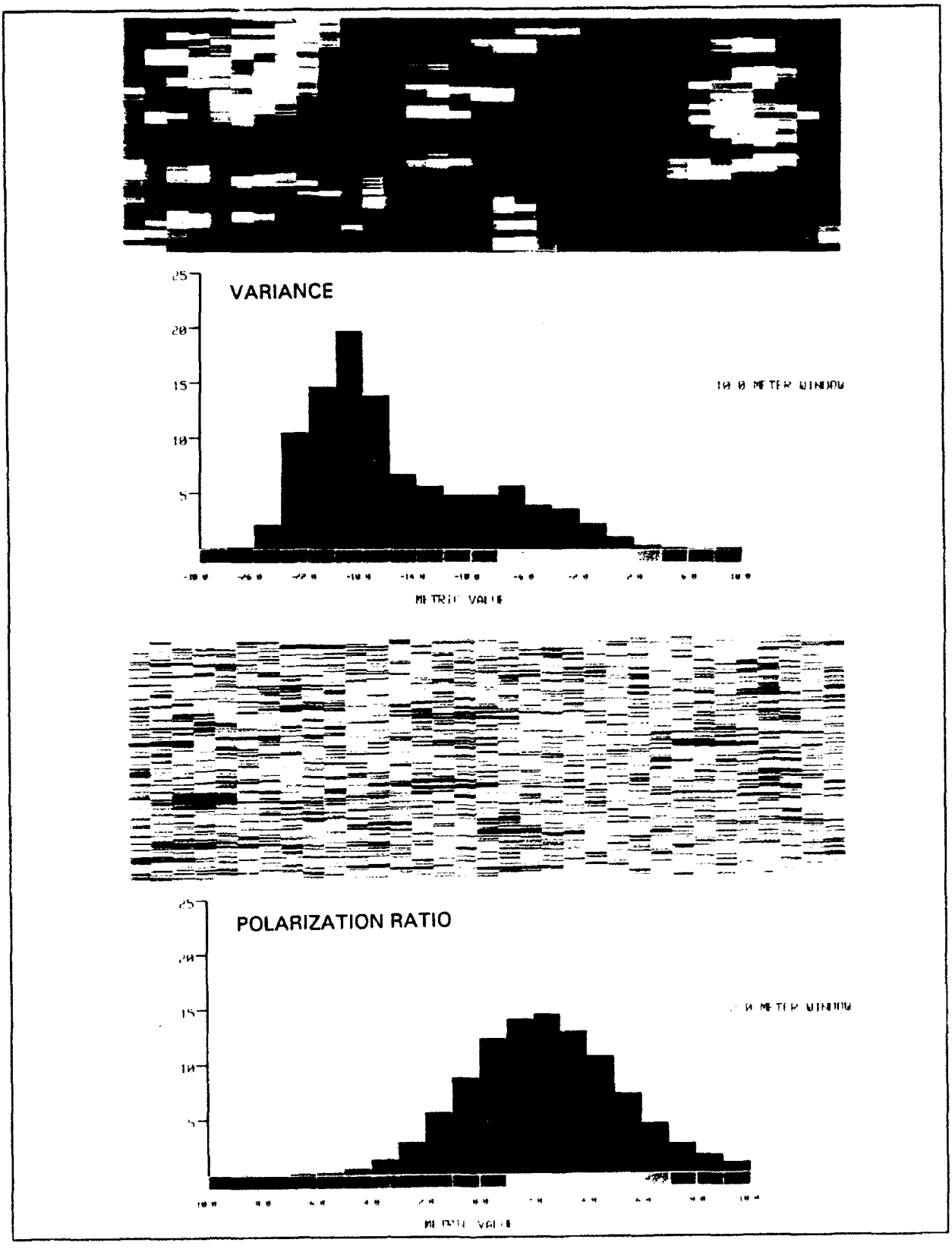
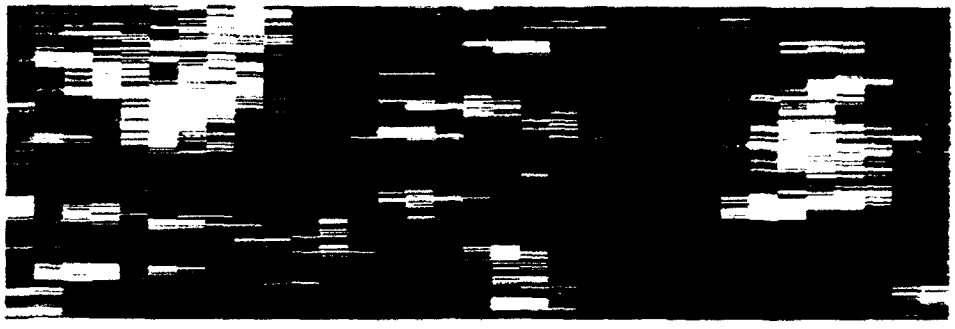
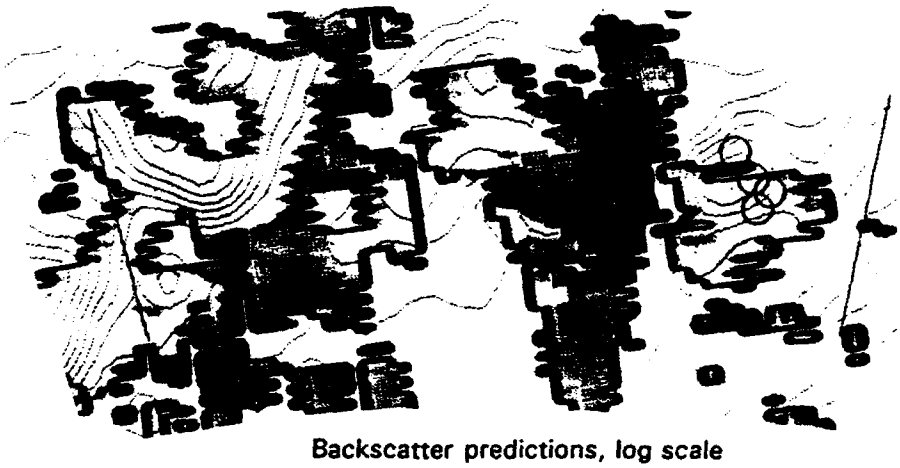


Figure C21. (Sheet 6 of 7)



Measured data, log scale



Backscatter predictions, log scale

Terrain contours and vegetation overlay

Figure C21. (Sheet 7 of 7)

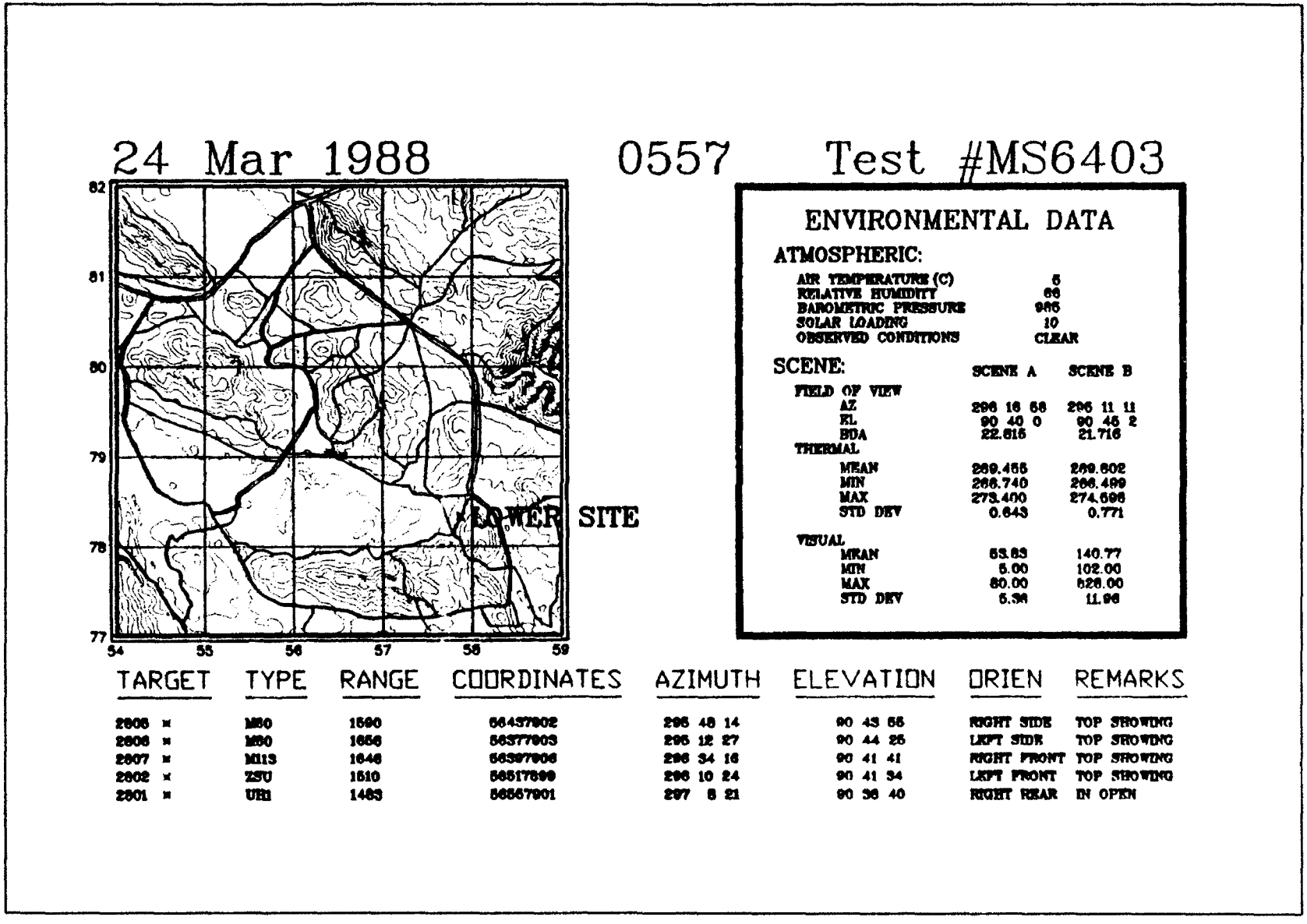


Figure C22. Summary data for MS6403 (Sheet 1 of 7)

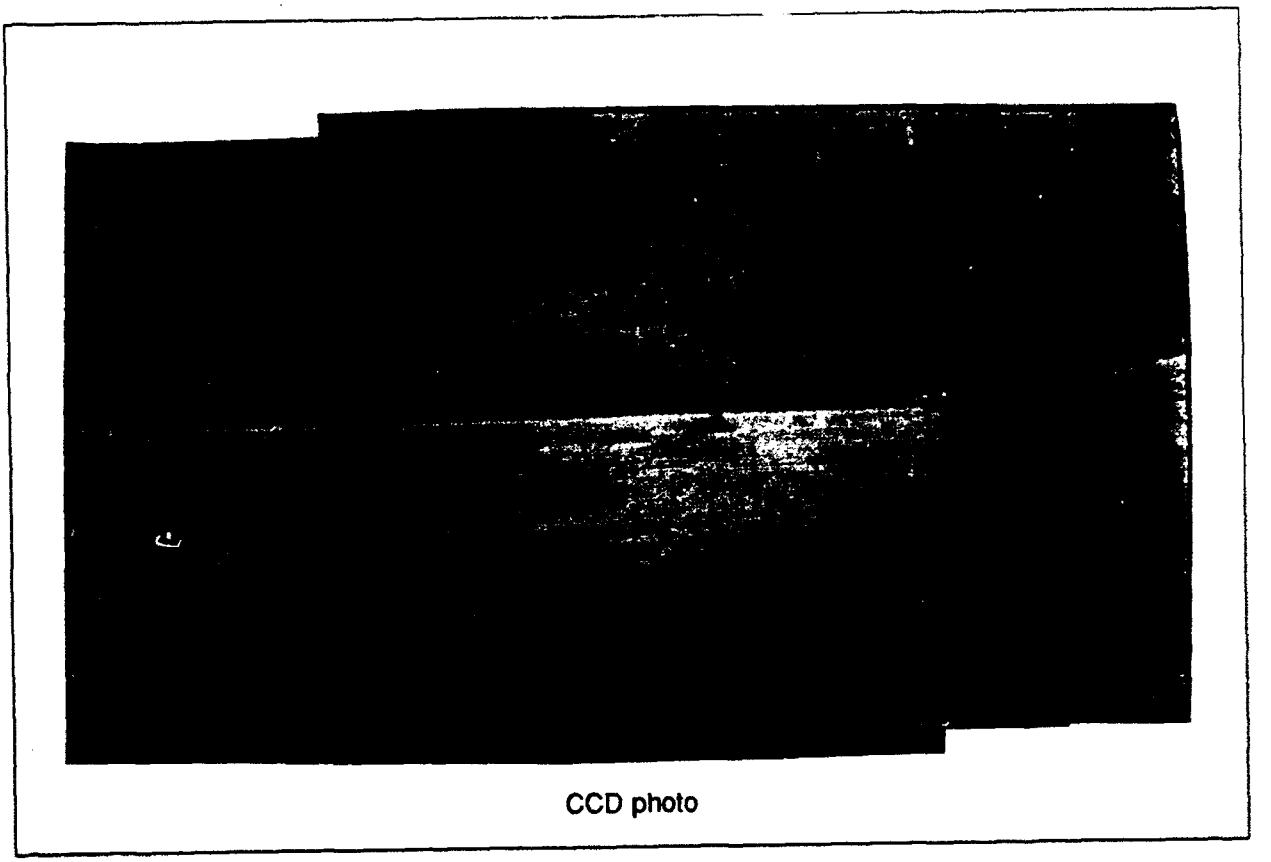
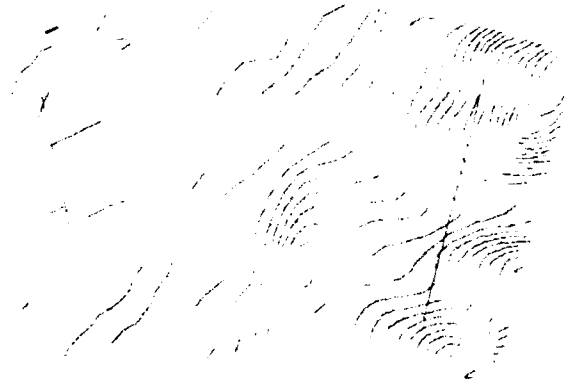


Figure C22. (Sheet 2 of 7)

Overhead photo



Terrain contours (10-ft interval)

Figure C22. (Sheet 3 of 7)

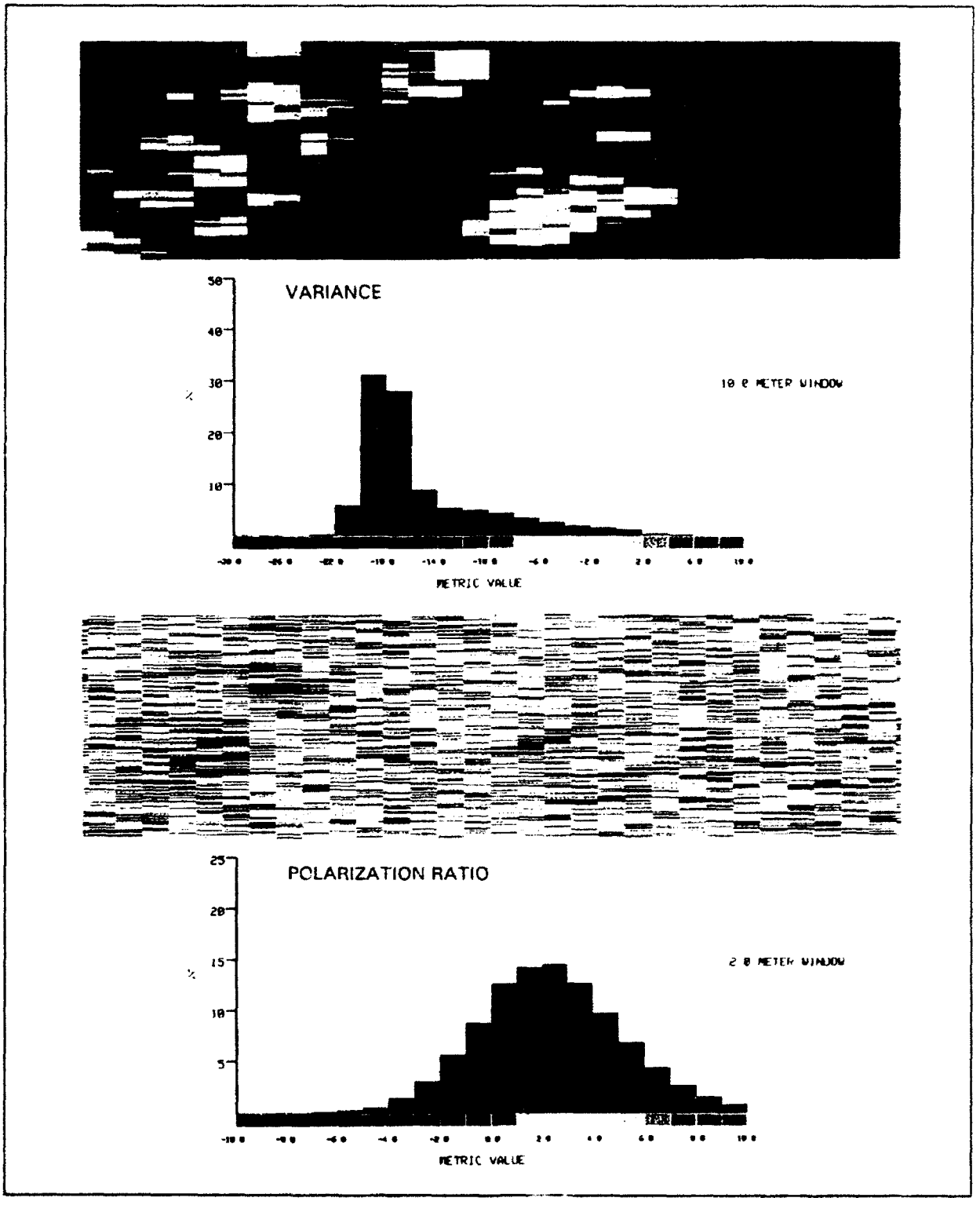


Figure C22. (Sheet 4 of 7)

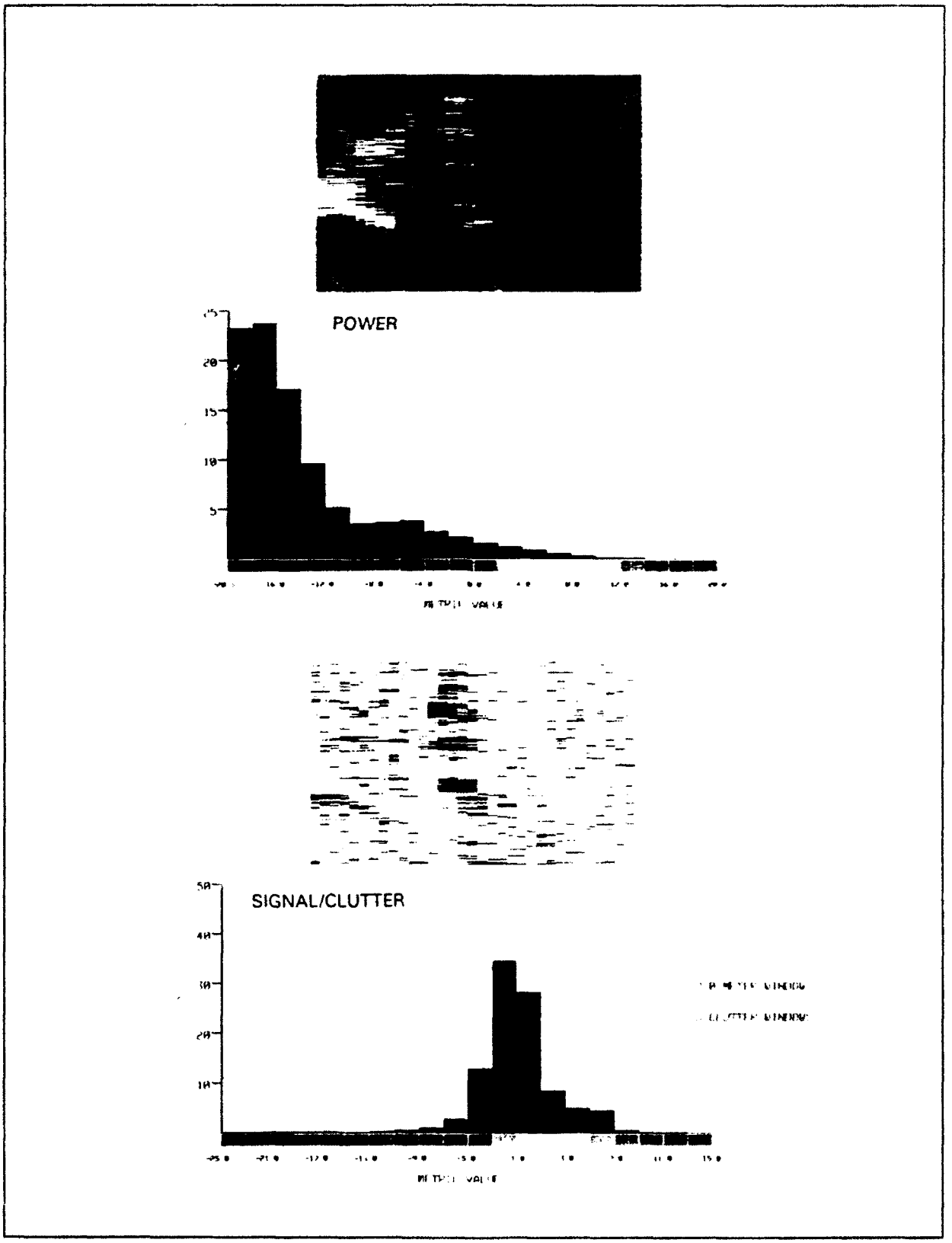


Figure C22. (Sheet 5 of 7)

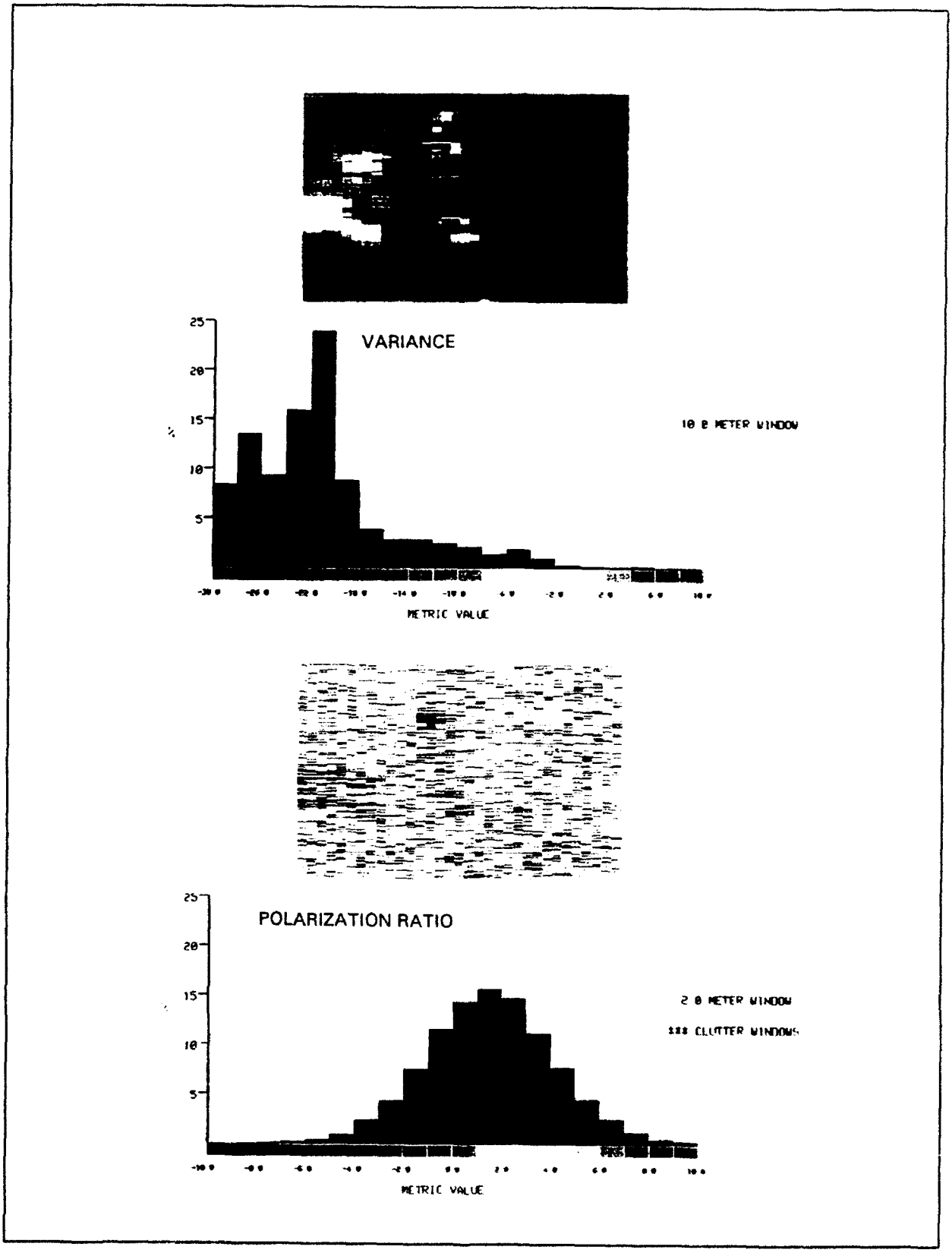
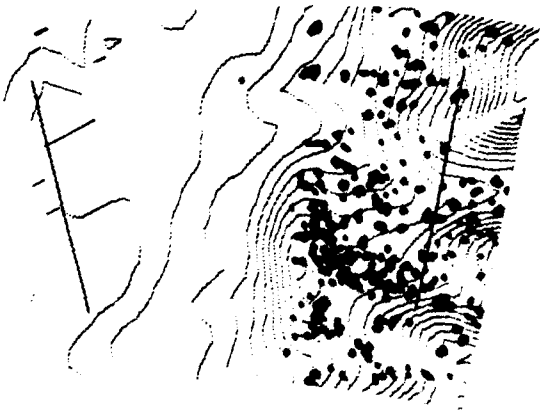


Figure C22. (Sheet 6 of 7)

Measured data, log scale

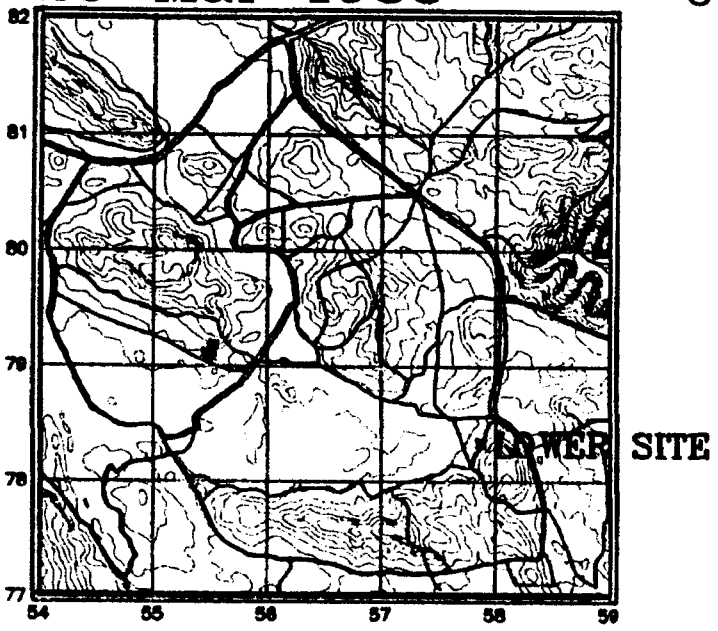
Backscatter predictions, log scale



Terrain contours and vegetation overlay

Figure C22. (Sheet 7 of 7)

25 Mar 1988 0555 Test #MS6603



ENVIRONMENTAL DATA

ATMOSPHERIC:

AIR TEMPERATURE (C)	17
RELATIVE HUMIDITY	29
BAROMETRIC PRESSURE	955
SOLAR LOADING	9
OBSERVED CONDITIONS	CLEAR

SCENE:	SCENE A	SCENE B
FIELD OF VIEW		
AZ	289 10 33	287 39 58
EL	89 34 6	90 26 60
HDA	15.305	13.680
THERMAL		
MEAN	283.641	282.673
MIN	276.986	277.656
MAX	286.330	286.365
STD DEV	0.740	0.793
VISUAL		
MEAN	86.66	159.48
MIN	3.00	105.00
MAX	160.00	207.00
STD DEV	26.27	21.68

TARGET	TYPE	RANGE	COORDINATES	AZIMUTH	ELEVATION	ORIEN	REMARKS
2301 x	M113	2490	55537919	290 14 8	90 11 42	LEFT FRONT	IN OPEN
2303 x	M60	2494	55517916	288 52 32	90 23 28	LEFT FRONT	WITH BRUSH
2305 x	M60	2510	55477908	287 24 21	90 22 44	RIGHT FRONT	IN OPEN
2304 x	UH1	2476	55517909	287 54 33	90 26 6	CANCELLED	
2306 x	ZSU	2535	55467912	288 13 59	90 22 44	REAR	IN OPEN

Figure C23. Summary data for MS6603 (Sheet 1 of 7)

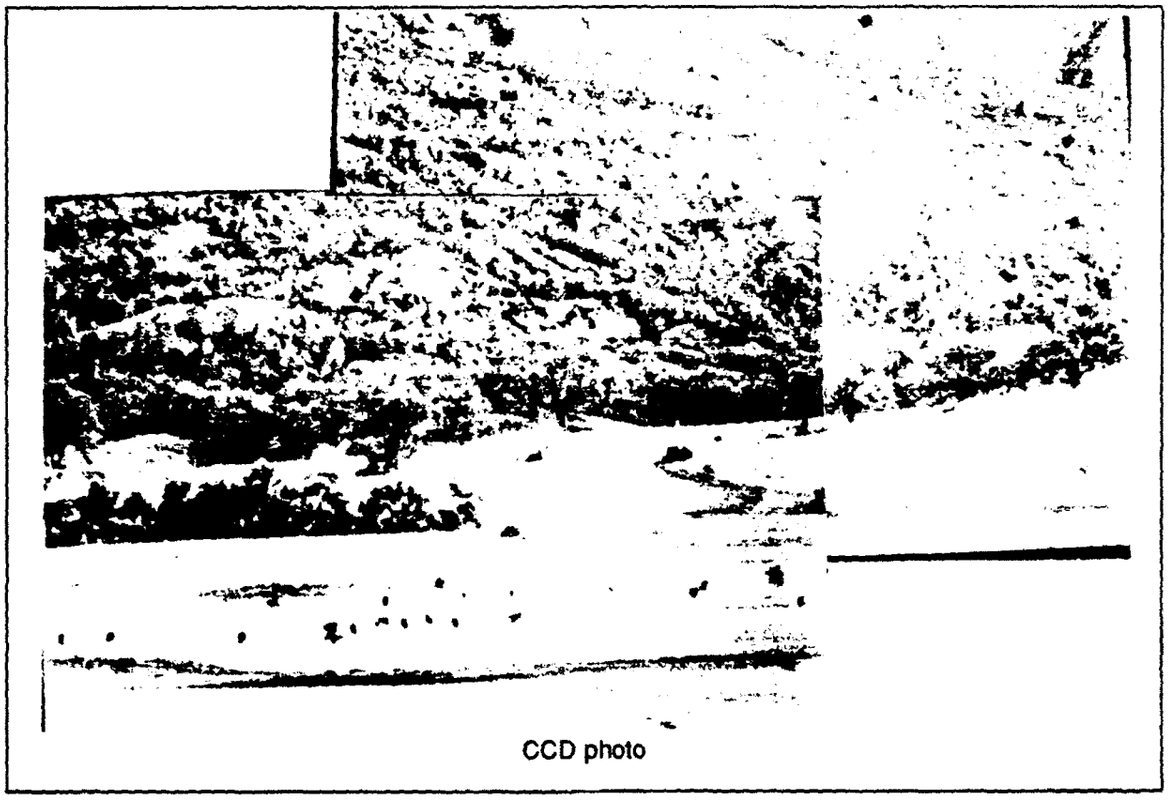


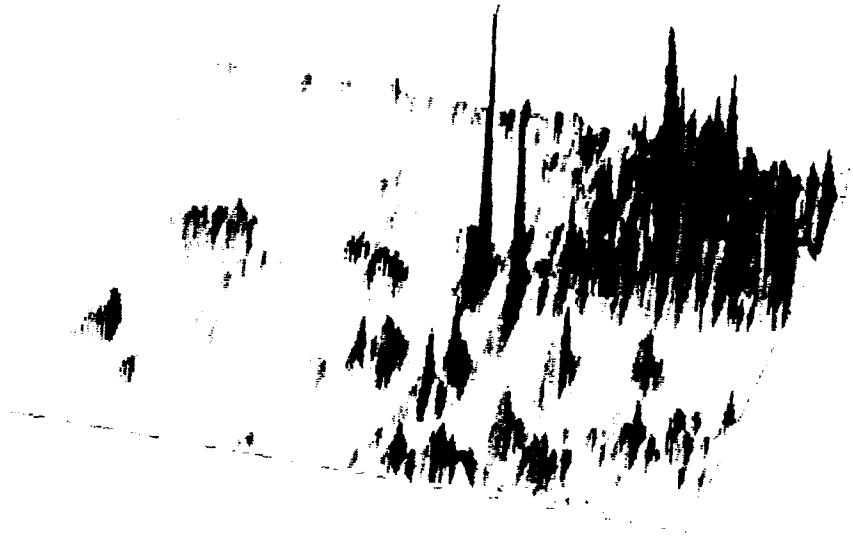
Figure C23. (Sheet 2 of 7)

Overhead photo

Terrain contours (10-ft interval)

Figure C23. (Sheet 3 of 7)

Measured data, linear scale



3-D plot of measured data, linear scale

Figure C23. (Sheet 4 of 7)

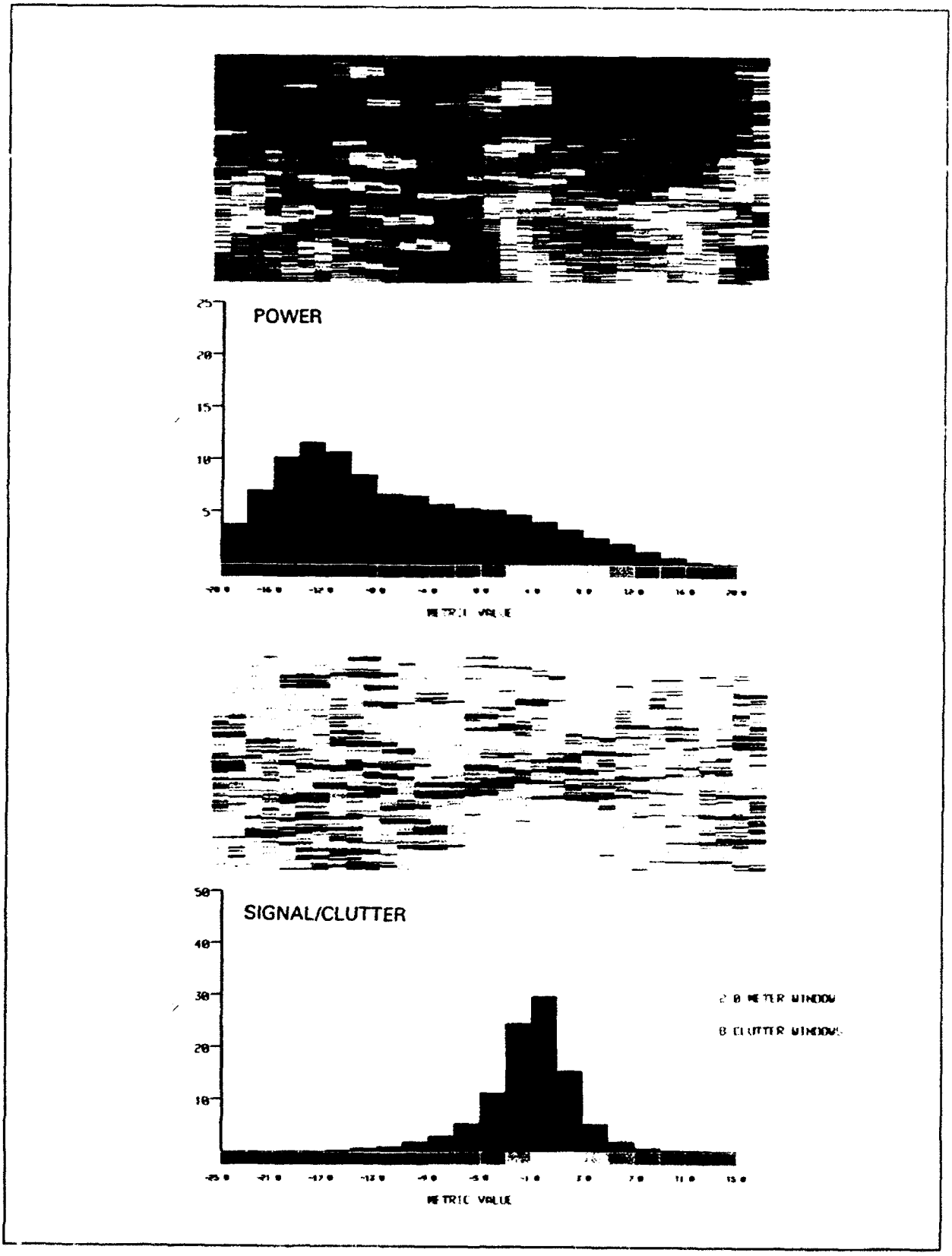


Figure C23. (Sheet 5 of 7)

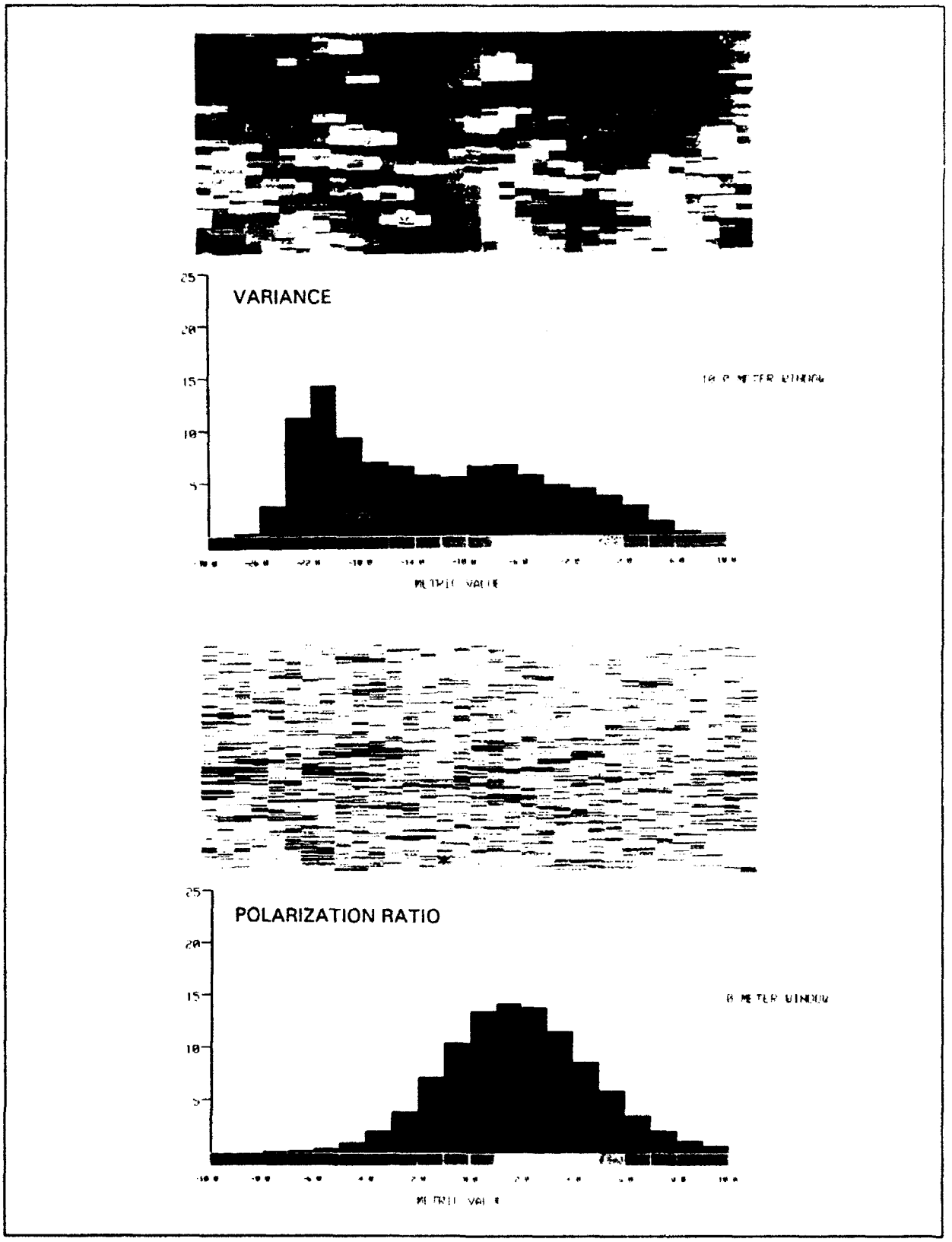
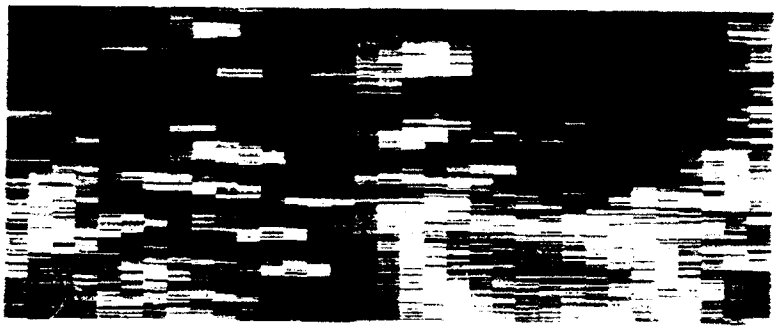
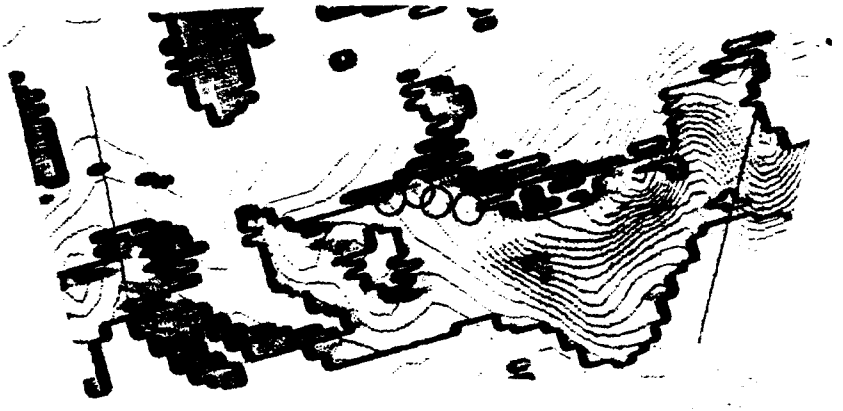


Figure C23. (Sheet 6 of 7)



Measured data, log scale



Backscatter predictions, log scale

Terrain contours and vegetation overlay

Figure C23. (Sheet 7 of 7)

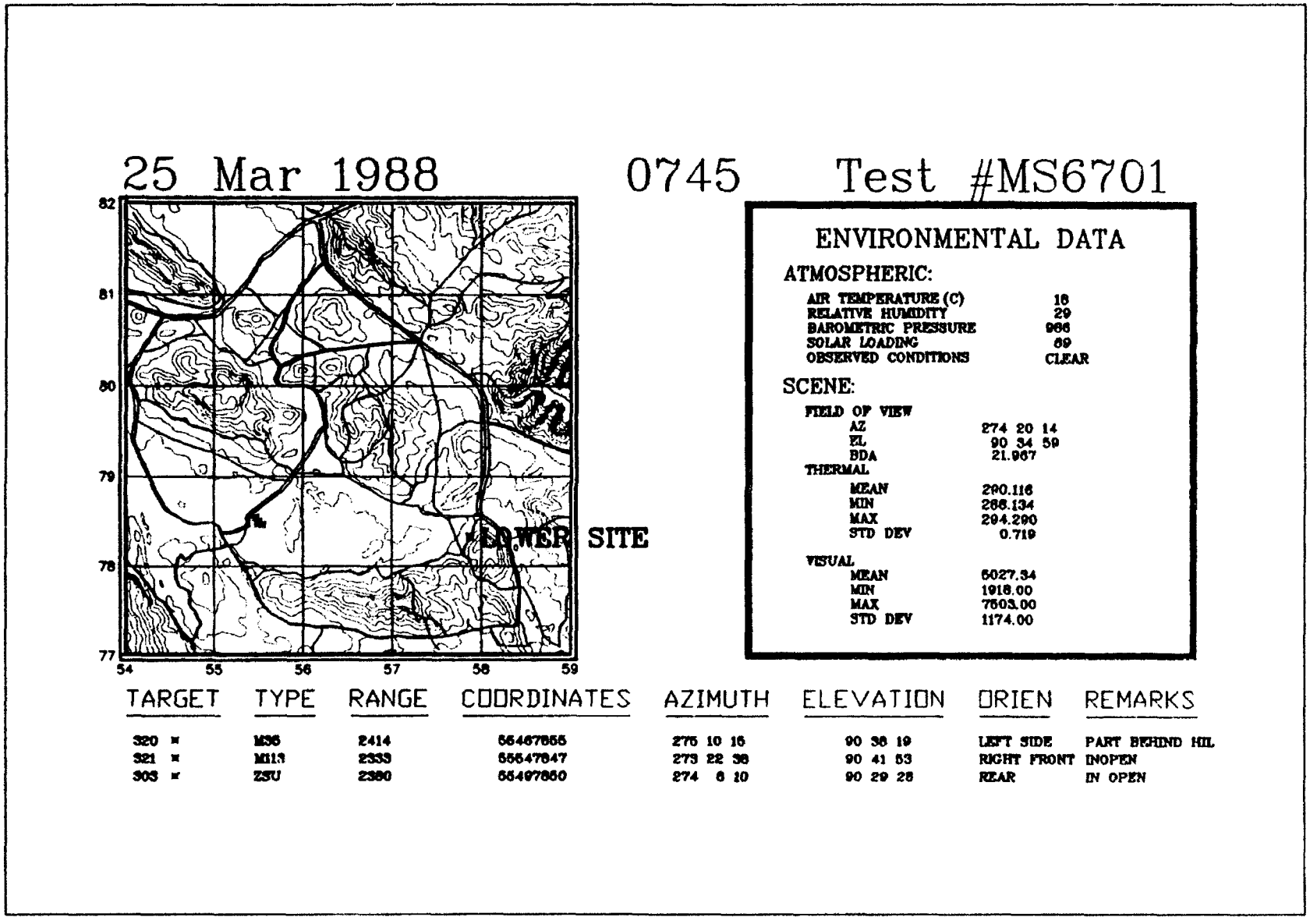
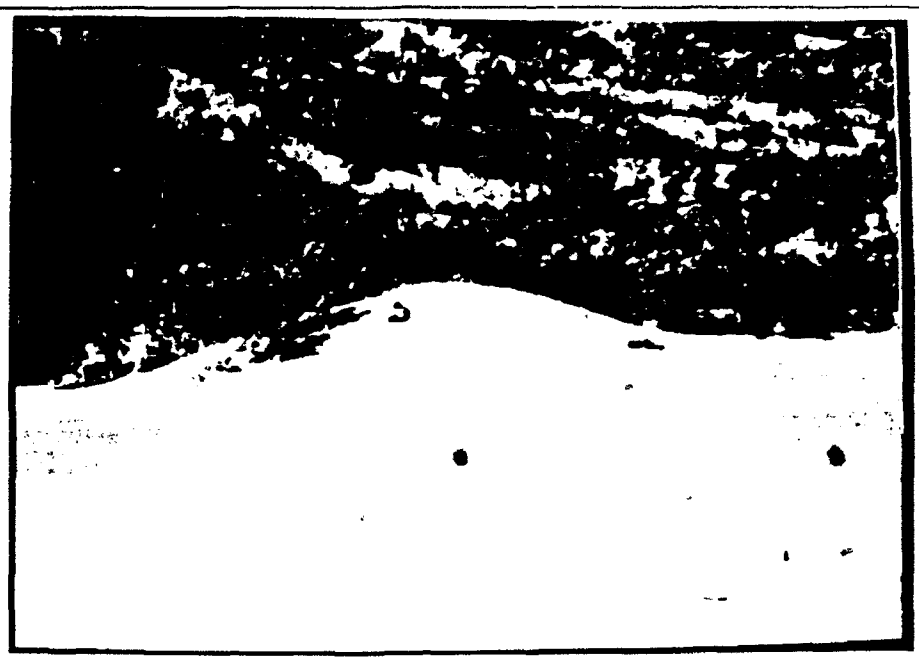
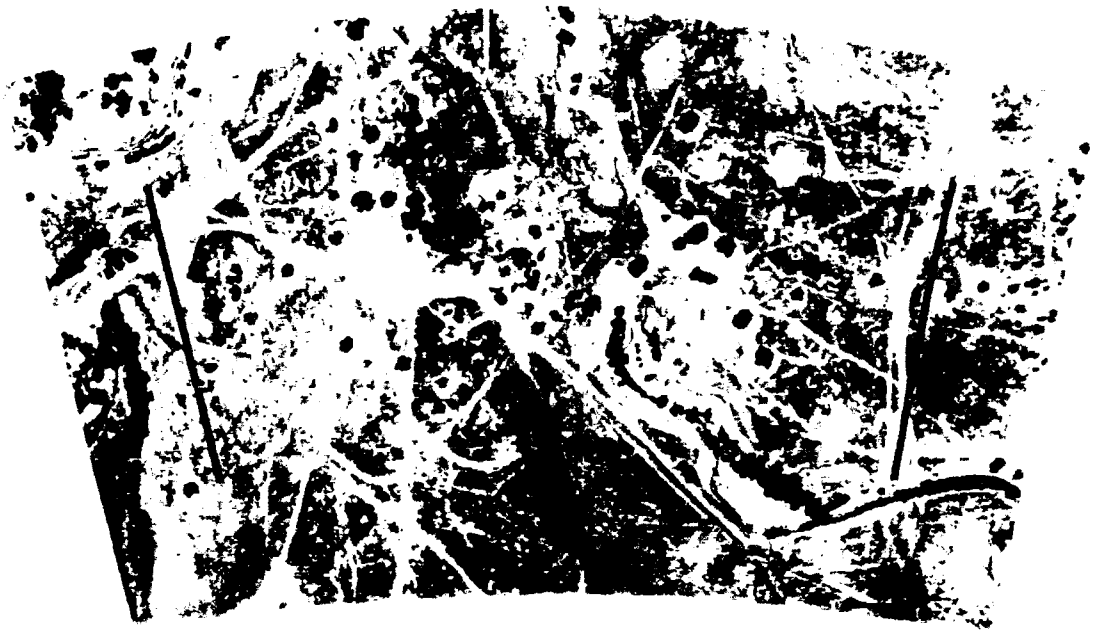


Figure C24. Summary data for MS6701 (Sheet 1 of 7)



CCD photo

Figure C24. (Sheet 2 of 7)

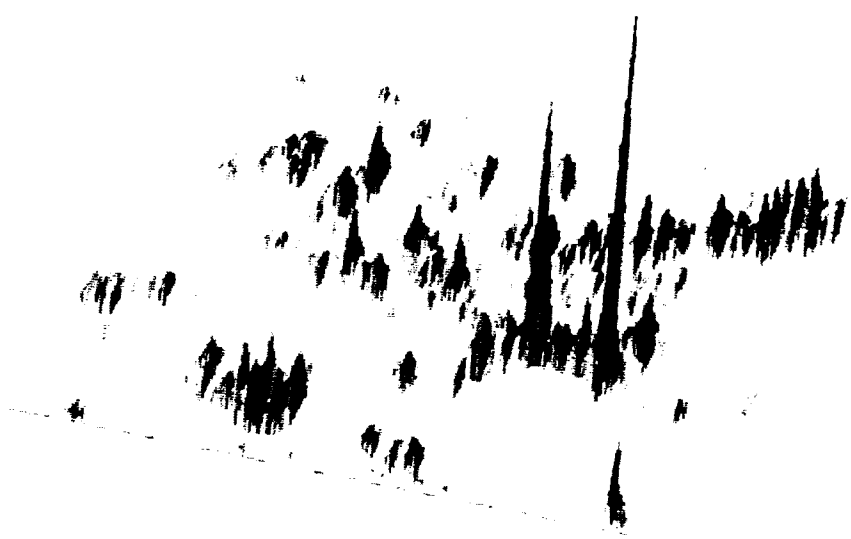


Overhead photo

Terrain contours (10-ft interval)

Figure C24. (Sheet 3 of 7)

Measured data, linear scale



3-D plot of measured data, linear scale

Figure C24. (Sheet 4 of 7)

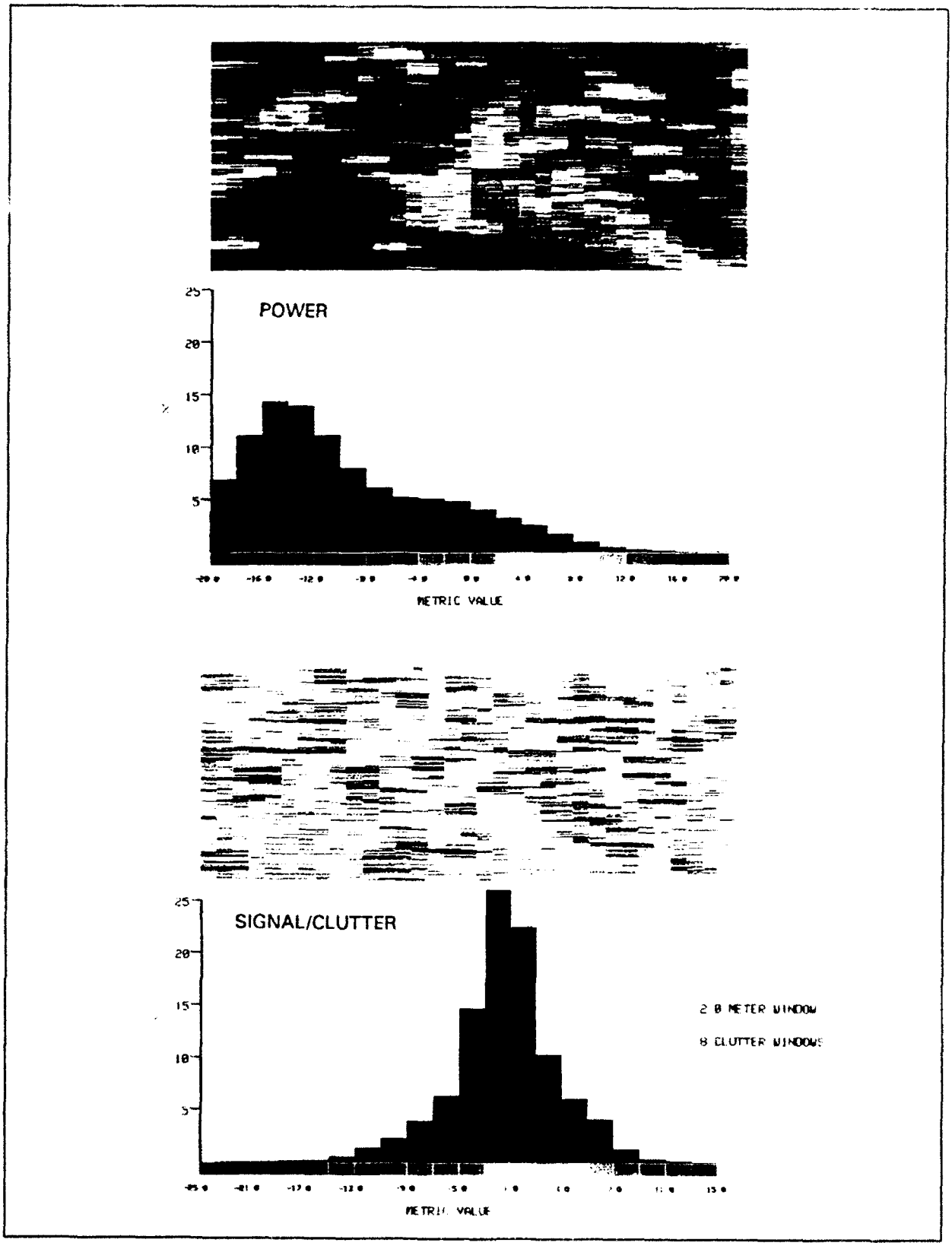


Figure C24. (Sheet 5 of 7)

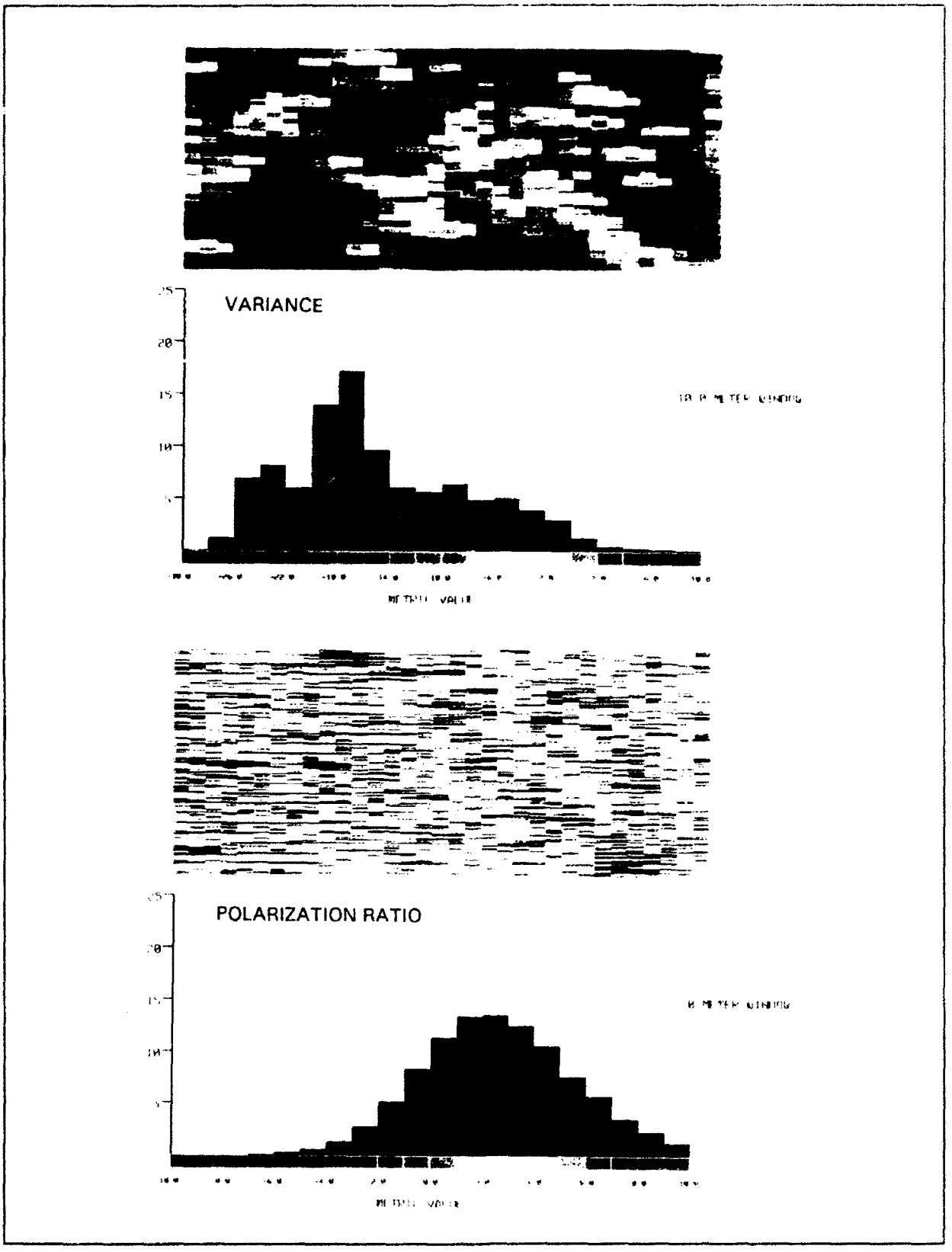
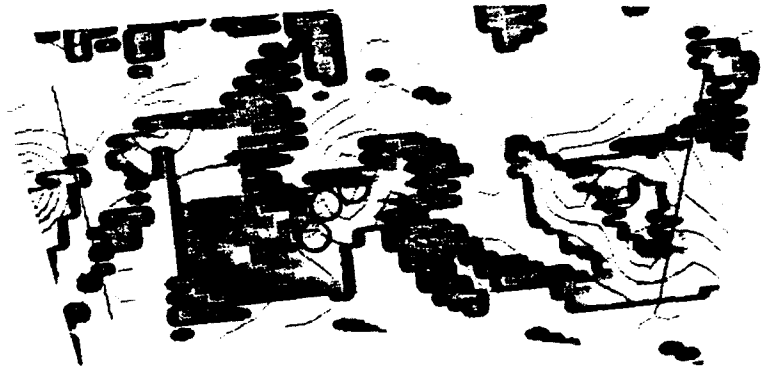


Figure C24. (Sheet 6 of 7)

Measured data, log scale



Backscatter predictions, log scale

Terrain contours and vegetation overlay

Figure C24. (Sheet 7 of 7)

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13. ABSTRACT *(Maximum 200 words)*

In an attempt to develop a scene characterization methodology for long-range (2 to 7 km), low-grazing angle (<10 deg or .17 radians) active millimeter wave radar systems, a twofold approach is taken. First, slant range versus azimuth maps of radar backscatter measurements are filtered to collect statistics on the occurrence of target-like features and to relate those signatures to natural terrain conditions. Second, a prediction of radar return from the terrain is modeled by a point light source at the radar location and the assumption of Lambertian scattering from the terrain facets. Model predictions are combined with overlays of vegetation at each test site and compared qualitatively with the measured data to assess the impact of terrain conditions on backscatter response. These approaches are applied to a set of test site K_a-band radar measurements made at Fort Hunter Liggett during the winter of 1988.

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